

PBW

*Consulting Engineers
and Scientists*

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SUPERFUND DIV.
REMEDIAL BRANCH
(6SF-R)

PASTOR, BEHLING & WHEELER, LLC
2201 Double Creek Drive, Suite 4004
Round Rock, TX 78664

Tel (512) 671-3434
Fax (512) 671-3446

March 30, 2010
(PBW Project No. 1597)

VIA ELECTRONIC MAIL AND
OVERNIGHT DELIVERY

Mr. Gary Miller
Superfund Division, Region 6 (6SF-AP)
Arkansas/Texas Section
U.S. Environmental Protection Agency
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

Ms. Barbara A. Nann, Assistant Regional Counsel
U.S. Environmental Protection Agency, Region 6
Superfund Division (6RC-S)
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733



885106

Re: Advance Notice of Tank Sampling Activities, Gulfco Marine Maintenance Site, Freeport, Texas

Dear Mr. Miller and Ms. Nann:

Per our recent telephone conversations and pursuant to Section XII, Paragraph 55 of the amended Unilateral Administrative Order for the Site, effective January 31, 2008 (the amended UAO) for the above-referenced Site, Pastor, Behling & Wheeler, LLC (PBW), on behalf of LDL Coastal Limited LP (LDL), Chromalloy American Corporation (Chromalloy) and The Dow Chemical Company (Dow) (collectively referred to as Respondents in the UAO and the Statement of Work (SOW) attached thereto), herewith provides advance notice of planned sampling of tank contents at the aboveground storage tank (AST) tank farm at the Site projected to begin on or after April 6, 2010. Pre-sampling mowing and weed eating of the AST tank farm area is scheduled to begin on April 5, 2010.

In support of the planned activities and consistent with your request and/or UAO requirements, we are also providing the following:

1. Description of Planned Activities – Previous sampling of the AST contents was performed during the period from December 14 through 15, 2006. That work was performed in accordance with a Work Plan dated November 6, 2006 (and addendum dated December 1, 2006) that were approved by an EPA letter dated December 4, 2006. Additional sampling of the tank contents is needed for the purposes of verifying the waste classification of the tank contents and developing waste profiles for submittal to the waste management facilities. Details of the planned activities are provided in the sampling plan included as Attachment A to this letter. In addition to

the tank content sampling, samples of the accumulated water within the two AST tank farm containment areas will also be performed.

2. Health and Safety Plan – A health and safety plan for performing this work is included in Attachment B.
3. Names, titles and qualifications of the tank content sampling contractor (per Paragraph 42 of the UAO) – Tank content sampling will be performed by Columbia Environmental Services, Inc. Columbia's qualifications are provided in Attachment C. Laboratory analyses will be performed by Gulf Coast Analytical, Inc (GCAL), the laboratory performing analyses for the RI/FS at the Site.
4. Insurance Certificate (per Paragraph 84 of the UAO) – Columbia's insurance certificate is included as Attachment D.
5. Quality Management Plan (per Paragraph 42 of the UAO) – As a subcontractor to PBW, Columbia will be covered under PBW's Quality Management Plan (QMP) which was previously submitted to and approved by EPA.

In accordance with Paragraph 52 of the UAO, I certify that I have been fully authorized by the named Respondents in the opening paragraph of this letter to submit this information and to legally bind these Respondents thereto.

Thank you for your continued support on this project. Should you have any questions or comments regarding these planned activities, do not hesitate to contact me.

Sincerely,

PASTOR, BEHLING & WHEELER, LLC

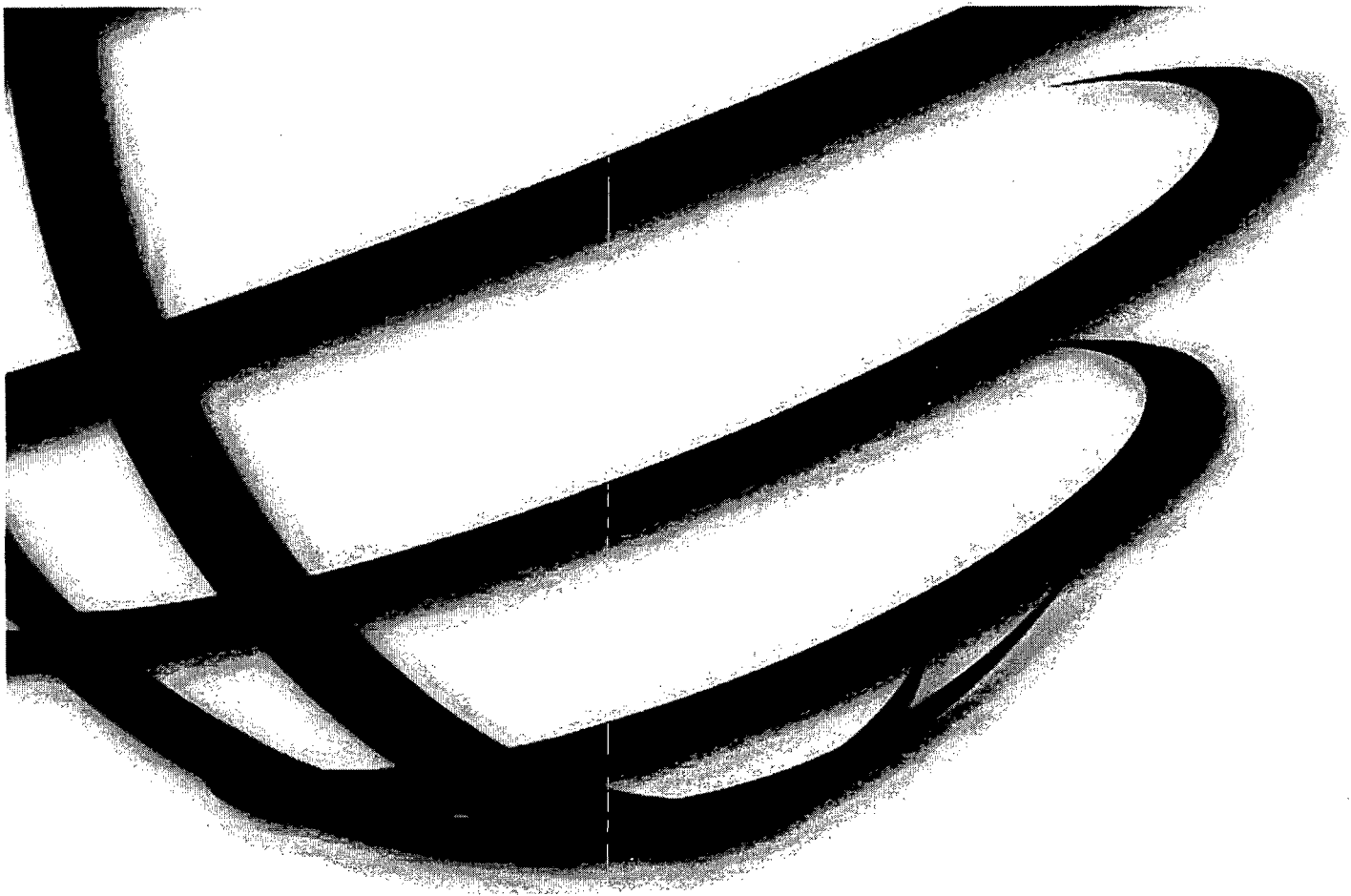


Eric F. Pastor, P.E.
Principal Engineer

cc: Mr. Brent Murray – Environmental Quality, Inc.
Mr. Ray Merrell – Sequa Corporation
Mr. Donnie Belote – The Dow Chemical Company
Mr. Allen Daniels - LDL Coastal Limited, LP
Mr. F. William Mahley - Strasburger & Price, LLP
Mr. James C. Morriss III - Thompson & Knight, LLP
Ms. Elizabeth Webb - Thompson & Knight, LLC
Mr. Greg Blomquist – Columbia Environmental Services, Inc.

ATTACHMENT A

**COLUMBIA ENVIRONMENTAL SERVICES, INC.
TANK SAMPLING PLAN**



Columbia Environmental Services Inc.

**Sampling and Analysis Plan
AST Tank Farm
March 2010**

For:

**Pastor, Behling & Wheeler, Llc
2201 Double Creek Dr., Suite 4004
Round Rock, Tx 78664**

At:

**Gulfco Marine Maintenance Superfund Site
906 Marlin Avenue
Freeport, Texas**

**GULFCO MARINE MAINTENANCE SUPERFUND SITE
906 MARLIN AVENUE
FREEPORT, TEXAS**

**SAMPLING AND ANALYSIS PLAN
March 29, 2010**

Columbia Environmental Services, Inc. (Columbia) has been contracted to sample, characterize, and dispose of above ground storage tanks (ASTs) contents and tanks at the Gulfco-Marine Maintenance Superfund Site located in Freeport, Texas. As part of the authorized Scope of Work, Columbia is preparing this Sampling and Analysis Plan (SAP) to characterize the tanks' contents for disposal. This document includes the sampling methodologies, analytical methods, and rationale used to perform the work. Columbia will perform all work in accordance with the Site-Specific Health and Safety Plan (HASP). As such, all personal protective equipment (PPE) requirements are documented in the HASP and are not included herein.

SITE DESCRIPTION

The area covered by the SAP includes an aboveground storage tank (AST) farm located in the southern portion of the property. This AST farm portion of the property is considered the Site covered by this SAP. The AST Farm is a concrete-bermed area containing 14 ASTs; three of which appear to be empty. The contents of the ASTs are planned for removal and disposal at CERCLA-approved facilities permitted to accept the material and pre-approved by the consultant and the EPA. The contents of the ASTs are impacted by hazardous and non-hazardous materials and sampling of the contents is required for characterization and disposal.

ANTICIPATED SAMPLING LOCATIONS

The contents of each AST will require sampling and chemical analysis. Vertical ASTs will be accessed from the top to collect the required samples. Horizontal ASTs will be accessed from the access port on the top. The exact location of the sampling point will be determined during field activities. The sampling points and gauging points will be accessed using ladders and/or a man-lift equipped with safety harnesses.

The ASTs may contain water, various organic phases, oily sludges, sand, rust solids, and debris as identified in the past by others during work conducted between 1999 and 2006. Others previously identified the ASTs' chemical contents as: benzene; chloroform; 1,2-dichloroethane; trichloroethylene; tetrachloroethylene; vinyl chloride; and petroleum hydrocarbons in various concentrations. ASTs and their documented contents are shown on Table I.

SAMPLING METHODOLOGIES AND TASKS

Columbia plans to have four personnel on site during the SAP activities. These personnel consist of one Project Manager, one Health and Safety Officer, and two Technicians. Prior to the commencement of SAP activities, the site will be mowed and a weed eater used to remove high grass that is obstructing the work area.

Columbia will collect one composite representative sample from each AST. Columbia will collect the samples using the following sampling protocols.

Tank Gauging

Columbia plans to use graduated stick gauges or tape with hydrophobic paste to determine the quantity of each phase of liquids in each AST and their percent by volume. The stick/tape will be inserted through the top access point to bottom of fluids. Upon removal of the stick/tape from the AST, the paste on the stick will be evaluated for liquid phase interfaces, and the results will be recorded in the field log. Technicians will take additional measurements of the tanks to determine the quantity and proportional percentages of solids and liquids in the ASTs for sample composite purposes.

Liquids

Liquids, including phase-separated compounds and water, shall be collected using clean bomb sampling device. This device is designed to be resistant to the known chemicals of concern. The clean sampling bomb will be lowered through the liquid column using new, clean rope or twine attached to the bomb. The bomb will be lowered through the liquid column to collect discrete representative samples of each liquid-phase. Samples will be collected throughout the liquid column and composited into one phase proportional sample representing the specific phase sampled. For example, light non-aqueous phase liquid (LNAPL) will be sampled and composited for one sample representing the LNAPL column in a specific AST.

Once the bomb is removed from the AST and transported to the sample staging area, the sample will be collected from the bomb and placed in the laboratory supplied sampling containers required for the specific chemical analysis. Additional analysis above and beyond what was identified in each tank may be required by the disposal facility. The chemical analysis anticipated for each AST is shown on Table 1.

Sludge and Sediments

Columbia will attempt to use the same sampling protocol for sampling the sludge as used to sample the liquids, if possible. If sample recovery is inadequate, Columbia will use the same sampling protocol to sample the sludge as is used to sample the sediments.

Columbia shall use a clean stainless steel probe sampling device with a catcher attached to the bottom to prevent loose sediments and/or sludge from being washed out of the sample container during sample retrieval. Columbia will collect a representative sample of the sludge and sediment column for inclusion in one proportional composite sample that is representative of the sludge and sediment column. The sampling device will be immediately transported to the sample staging area after sample collection. The sample will be transferred to the sample containers using a clean stainless steel trowel, spoon or knife.

Sample Packaging

Columbia will transfer the sample material from the sampling devices to sample containers in a central staging area near the AST Farm. The sample staging area will be comprised of plastic sheeting on the ground that is bermed to prevent any spillage from contacting the ground. The plastic sheeting will be containerized at the end of each days work and before any rain event. The exact location of the central staging area will be determined in the field by the Columbia Project Manager.

Columbia will use laboratory supplied sample containers that are prepared specifically for the required analyses by the analytical laboratory. The laboratory will add any necessary preservatives prior to shipment of the sample containers to the Site.

Columbia will fill each sample container to the top with zero headspace to prevent volatile organic compounds (VOC) from escaping the samples. Columbia will tightly seal each sampling container with a laboratory supplied Teflon lid. Columbia will label the sample containers using an indelible marker on the top of the lid with the sample ID just in case the label is prematurely removed or becomes un-readable. The Columbia Technician will also use the marker to fill out a water resistant label that will be placed on the container. The label will include:

- Sampling identification name;
- Name or initials of collector;
- Date and time of collection;
- Sample type (soil, liquid, etc.)
- Analysis required (if space on label allows); and
- Preservative inside bottle, if applicable.

The sampling containers shall be placed in bubble-rap prior to placing them in

the cooler to decrease the chance of accidental breaking of the containers while in transport. The sampling containers will be immediately placed in a cooler and immediately chilled prior to transport to the laboratory.

Columbia will prepare a sampling field log for each sample collected. The sampling log will include all pertinent information concerning the sampling event. This information includes but is not limited to the following:

- Tank gauging data;
- PPE used;
- Description of sampling activities;
- Description of equipment used;
- Weather conditions at the time of sampling;
- Start and stop time;
- Sampling date and time;
- Analysis requested that should match the chain of custody;
- Name of the sampling technician;
- Any other information the sampling technician deems important.

Equipment Decontamination

Columbia intends to decontaminate all sampling equipment prior to use at the Site and between AST sampling events. When additional sample is required from the same AST, the sampling equipment will be used in the same AST without decontamination as long as the sampling device does not come in contact with any on site material. Disposable equipment meant to be used only once may be re-used at the same sampling point provided that it has not come in contact with other site material. The disposable sampling equipment will be decontaminated prior to being containerized for disposal.

All sampling equipment will be decontaminated prior to use unless the equipment is properly packaged and sealed by the factory. All non-disposable components of the sampling equipment will be decontaminated as follows:

- Potable water rinse;
- Industrial grade detergent wash;
- DI water rinse;
- Industrial grade detergent wash;
- DI water rinse; and
- Air dry.

If Columbia sees evidence of organic staining on equipment after the equipment has been cleaned, a methanol or hexane rinse shall be used on the equipment. Columbia will place clean equipment in new, sealed bags to keep the equipment clean during storage after decontamination of equipment between sampling points. The sealed bags will not be reused except for disposal purposes. Columbia will containerize all liquids and waste generated as a result of sampling and decontamination processes. Containerized wastes will be handled as

investigation-derived waste (IDW).

Columbia shall ship the samples to the laboratory generally on the day they are collected.

Chain of Custody

Columbia will follow strict chain-of-custody (COC) protocol throughout the sample handling process by documenting evidence of collection, shipment, and laboratory receipt on the COC. After placing the last sample for the day in the cooler and the COC in a watertight container, the sampling technician will place a seal on the cooler, initial the seal, and transport the cooler to the laboratory by courier.

** The commercial carrier is not considered part of the COC chain and is not required to sign the COC.

The chain of custody will be completed in full prior to the samples leaving the site or being turned over to the transporter/courier. The sampling technician will relinquish the samples to the person taking possession of the samples after signing, dating, and recording the time on the COC in the appropriate location.

Columbia shall consider a sample "in custody" if it is:

- Possessed by a person;
- In view of a person after being in physical possession of the person;
- Sealed so that no person can tamper with it while in possession of a person; and/or
- In a secured area restricted to authorized personnel where a person in custody has access..

Columbia will use a COC to record the collection and shipment of all samples. The COC will specify the following information:

- Name and address of sample collection location;
- Laboratory name where samples will be analyzed;
- Sample bottle size, identification number, date and time collected, preservative, analysis type and method,
- Directions/instructions to laboratory;
- Sample type (liquid, solid etc)
- Signature of collector as relinquishing, with date/time.
- Signature of the receiver with data and time.

Upon receipt by the laboratory, a designated laboratory worker shall open the shipping containers, measure and record the temperature within the cooler, and evaluate the contents of the cooler for sample integrity. The contents will be compared with the COC and any discrepancies will be noted by the laboratory worker, and the Columbia project manager will be immediately notified of the discrepancy. The laboratory worker will sign and date the record as the sample receiver for the laboratory.

All Chain-of-Custody Records and transportation documents, if any, shall be kept as part of the project records.

CHEMICAL ANALYSIS

The samples collected from the ASTs will be submitted to GCAL, Inc. located at 7979 GSRI Avenue, Baton Rouge, LA 70820. The laboratory contact is Ed Gallagher. Mr Gallagher can be contacted by phone at 225-214-7059 or by email at edg@gcal.com.

Columbia intends to request a standard turn-a-round time of 10 working days for all samples.

The samples collected from the ASTs will be sampled for the parameters corresponding to the AST as shown on Table 1.

PAST
TANK CONTENTS
(2007)

TABLE 1 - SAMPLE ANALYTICAL PLAN

AST Number/ Sample Location	Chemical of Concern	EPA Code	Analytical Method(s)
2	Chloroform 1,2 Dichloroethane Hexachlorobenzene Benzene	D022 D028 D032 D018	TCLP Vol 8260 TCLP Semi Vol 8270 RCRA 8 Metals
4	Nonhazardous	NA	TCLP Vol 8260 TCLP Semi Vol 8270 RCRA 11 Metals TPH 1005
6	Nonhazardous	NA	TCLP Vol 8260 TCLP Semi Vol 8270 RCRA 11 Metals TPH 1005
13	Tetrachloroethylene Vinyl Chloride 1,2 Dichloroethane Benzene	D039 D043 D028 D018	TCLP Vol 8260 RCRA 8 Metals
14	If not found to be RCRA Empty	Unknown	TCLP Vol 8260 TCLP Semi Vol 8270 RCRA 11 Metals TPH 1005
15	Flash Point Benzene	D001 D018	Flash Point TCLP Vol 8260
16	Nonhazardous	NA	TCLP Vol 8260 TCLP Semi Vol 8270 RCRA 11 Metals TPH 1005
17	If not found to be RCRA Empty	NA	TCLP Vol 8260 TCLP Semi Vol 8270 RCRA 11 Metals TPH 1005
18	Flash Point Benzene Carbon Tetrachloride	D001 D018 D019	Flash Point TCLP Vol 8260
19	Flash Point Benzene 1,2 Dichloroethane Tetrachloroethylene Vinyl Chloride Carbon Tetrachloride 1,1 Dichloroethylene	D001 D018 D028 D039 D043 D019 D019	Flash Point TCLP Vol 8260
21	Benzene 1,2 Dichloroethane Tetrachloroethylene Vinyl Chloride Carbon Tetrachloride 1,1 Dichloroethylene Chloroform	D018 D028 D039 D043 D019 D029 D022	TCLP Vol 8260
22	Nonhazardous	NA	TCLP Vol 8260 TCLP Semi Vol 8270 RCRA 11 Metals TPH 1005
23	Flash Point Benzene Tetrachloroethylene Vinyl Chloride Carbon Tetrachloride 1,1 Dichloroethylene 1,4 Dichlorobenzene Selenium Hexachlorobenzene	D001 D018 D039 D043 D019 D029 D027 D010 D032	Flash Point TCLP Vol 8260 TCLP Semi-Vol 8270 RCRA 8 Metals

FULL OF
SOLIDS

3' AQUEOUS
LIQUID

SOLID - FULL,
LIKE CONCRETE

2 1/2' ORGANIC
LIQUID

EMPTY - 2" RUST
SOLIDS

1/2 FULL ORGANIC
LIQUID

FULL - ORGANIC
LIQUID

EMPTY - RUST
SOLIDS

ORGANIC LIQUID

4' ORGANIC
LIQUID

3/4 FULL -
ORGANIC
LIQUID

ORGANIC
LIQUID

ORGANIC
LIQUID

TANK #10 - EMPTY

AIR EMISSIONS AND HEALTH AND SAFETY

Columbia shall complete all work in accordance with an approved Site-Specific HASP, therefore, details concerning air monitoring for the SAP are not included herein, but are incorporated by reference.

Columbia intends to abate air emissions during sampling of the ASTs by placing a plywood shield over the sampling access point. The shield will have a four-inch diameter hole cut in the center to allow access to the AST contents. A hose intake will be placed next to the hole cut in the shield. The hose will be attached to an activated carbon canister and then to a vacuum pump. The vapors escaping through the four-inch diameter hole will be pulled through the carbon before being emitted to the atmosphere. Air will be monitored in accordance with the HASP.

QUALITY ASSURANCE PLAN

Columbia understands that the following will occur. Data validation will be performed at Data Review Level 2 as described in the approved Gulfco RI/FS Quality Assurance Project Plan QAPP (PBW, 2006b). Pastor, Behling & Wheeler, LLC (PBW) will provide a Field Project Supervisor during completion of the SAP activities who will be on site at all times while the work covered in this SAP is being completed.

As part of Analytical Level 2 protocol, one field blank sample shall be collected and included with the samples to the laboratory and analyzed for VOCs 8260 and RCRA 11 Metals. The field blank sample shall be collected by using a sampling a discrete sampling device and or push auger. The devices will be rinsed with de-ionized water and then refilled with de-ionized water. The water in the bailer will be placed in the same type of laboratory supplied containers as used to collect the tank content sample using the same protocol from sample collection to laboratory analysis. This sample will be used to determine if the sample handling process may have compromised sample integrity.

MS/M&D

ATTACHMENT B

**COLUMBIA ENVIRONMENTAL SERVICES, INC.
HEALTH AND SAFETY PLAN**



Columbia Environmental Services Inc.

**Health and Safety Plan For
AST Sampling and Removal Activities
March 2010**

For:

**Pastor, Behling & Wheeler, Llc
2201 Double Creek Dr., Suite 4004
Round Rock, Tx 78664**

At:

**Gulfco Marine Maintenance Superfund Site
906 Marlin Avenue
Freeport, Texas**

SITE-SPECIFIC HEALTH AND SAFETY PLAN

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APPENDIX I
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APPENDIX K
NEAR LOSS/LOSS INCIDENT INVESTIGATION FORM

SITE-SPECIFIC HEALTH AND SAFETY PLAN

Columbia Environmental Services Inc.(Columbia) has developed the following Health and Safety Plan (HASP) for use by Columbia personnel and by Columbia contractors (individually, an "Columbia Contractor" and collectively, "Columbia Contractors"). Columbia personnel must adhere to the practices and procedures specified in the HASP. Each Columbia Contractor must review the HASP and agree to accept and abide by the HASP, subject to any modifications to the HASP (to address the Columbia Contractor's more stringent practices and procedures) agreed upon in writing by Columbia and the Columbia Contractor. The Columbia Contractor shall indicate such acceptance by signing this document prior to commencing work at the Site. However, if any Columbia Contractor commences work at the Site, the Columbia Contractor shall be deemed to have accepted the HASP and the terms hereof and the failure to execute and return to Columbia a copy of this notice shall not be relevant to such interpretation.

If a contractor or a person other than the Client, Columbia employees and Columbia Contractors (individually, a "Third Party" and collectively, "Third Parties") receives a copy of the HASP, such Third Party should not assume that the HASP is appropriate for the activities being conducted by the Third Party.

NO THIRD PARTY HAS THE RIGHT TO RELY ON THE HASP. EACH THIRD PARTY SHOULD ABIDE BY ITS OWN SITE-SPECIFIC HEALTH AND SAFETY PLAN IN ACCORDANCE WITH ITS OWN PROFESSIONAL JUDGMENT AND ESTABLISHED PRACTICES.

Columbia shall not be responsible for the implementation of any Third Party safety program(s), except to the extent otherwise expressly agreed upon by Columbia and a Third Party in writing. The services performed by Columbia for the Client and any right of the client and/or an Columbia Contractor to rely on the HASP shall in no way inure to the benefit of any Third Party, including, but not limited to, employees, agents, or consultants and subcontractors of Columbia Contractors, so as to give rise to any cause of action by such Third Party against Columbia.

The HASP generated by Columbia in connection with the Project is for use on a specific site and in connection with a specific project. Columbia makes no representation or warranty as to the suitability of the HASP for reuse on another site or as to the suitability of the HASP for reuse on another project or for modifications made by the Client or a Third Party to the HASP.

By signing below, signee certifies that they have read, understand and will abide by the contents of this HASP. Signature required on this Document (HASP Signature Page).

[illegible]

1.0 PROJECT AND SITE INFORMATION

1.1 GENERAL PROJECT INFORMATION

Columbia developed this HASP for use on the Gulfco Marine Maintenance Superfund project for **Pastor, Behling & Wheeler, LLC (PBW)**. The general objectives of this project are:

- Removal of Aboveground Storage Tanks (ASTs) and tank contents
- Demolition of Aboveground Storage Tanks (ASTs)

1.1 SITE NAME AND ADDRESS

Gulfco Marine Maintenance:

The Gulfco Marine Maintenance facility is located approximately 3 miles northeast of the City of Freeport, Brazoria County, Texas, at 906 Marlin Avenue. The coordinates of the site are 28° 58' 07" north latitude, and 95° 17' 23" west longitude.

1.2 SITE DESCRIPTION

The Gulfco Marine Maintenance (Gulfco), facility encompasses 40 acres in Freeport, Brazoria County, Texas. The facility historically was used as a barge cleaning and servicing facility. The Gulfco site includes an AST tank farm and three former surface impoundments that received contaminated wash water from the barge cleaning operations

1.3 SPECIAL COMPANY SPECIFIC HEALTH & SAFETY REQUIREMENTS

This section describes the various health and safety requirements prescribed by Columbia and or client for work on the Gulfco Marine Maintenance Site. These include requirements specified for Columbia projects.

The client does not have any additional special requirements for the work governed by this HASP, other than those described in subsequent sections below.

1.3.1 Columbia Environmental Services Inc. Requirements

To provide a framework for communicating common expectations for safety and health issues, Columbia has implemented its own **Loss Prevention Program**. As part of this plan, certain management and safety related issues must be addressed prior to work at any facility. Prior to the first day of activity at the site, a Kickoff Meeting will be held. Additionally, prior to the initiation of each day's work activities a Daily Tailgate Safety Meeting Form and Equipment Checklist will be completed.

Also as part of the **Loss Prevention Program** a Job Hazard Analysis Form (JHA) will be created and reviewed for every task. JHAs forms are provided in Appendix C. If a High Risk task to be performed does not have a JHA, one must be developed and inserted into the HASP prior to performance of the work.

In any case where safety protocols appear to conflict, the rules providing the greatest degree of safety must be followed.

1.3.2

Damage to Owner's Property

If Columbia or Columbia Contractors damage any Gulfco property (other than intended damage associated with planned demolition activities), or property of any other contractor, the damage will immediately be reported to the Site Contact and an incident report will be completed.

1.3.3

Housekeeping

At all times the job site will be kept clean and free from debris, trash, and rubbish. All materials will be stored in a neat and orderly fashion.

1.3.4

Safety Rules Violations

Safety rule violations by Columbia employees or Columbia Contractors and unsafe operations that represent an immediate safety hazard or endanger the safety of site employees will be stopped immediately and will be brought to the attention of the Columbia Project Manager (PM). Such acts are cause for immediate removal from the site.

1.3.5

Dow Chemical Company

All field personnel will be required to go through Dow's STAC (safety task analysis card) training at the beginning of the project and then complete STAC cards at the start of each work day

Figure: 1A. Sample STAC Card (Front)

TYPES OF HAZARDS "EXPECT THE UNEXPECTED"		PERMIT REQUIREMENTS "ASK ALL THE RIGHT QUESTIONS AND QUESTION WHAT ISN'T RIGHT"		Safety Task Analysis Card (STAC) PERSONAL WORK PERMIT "My plan for a safe job"	
Asphyx Congrated area, Uneven ground, Confined Space, Overhead obstruction, Objects in walkway, Unseal and decking, Chutes Catch in Squeeze By Sharp objects, Pinch points, Hot/cold surfaces, Open holes, Overhead workers, Struck by objects, Struck against objects, Fire/explosion Electrocution Noise, Dust, Weather, Lighting, Heat, Wet areas, Wind, Plant processes, Lead, Asbestos, Hot/Cold surfaces, Heat Stress Ergonomic Bad body position, Improper or static body position (awkward objects or work position), Excessive force (heavy objects, torque), Excessive repetition, Excessive duration, Over-reaching Falls To a lower level, At the same level, Slippery surface, Floor or wall opening, Unprotected perimeter, Climbing, Relocating, Common Hazardous Material Burns, Exposure, Inhalation, Splashing, Fumes, Spills, Airborne Particles, Toxins, Substances, Lead, Asbestos, Radiation Struck Events Pneumonia, Tetanus, Electrical, Contaminants, Flammable/Explosive, Static electricity Tool/Equipment Airborne particles, Fumes, Air Bubbles, Sharp edges, Line of fire, Wrong tool for the job, Broken tools, Rotating parts, Vibration, Shock		Y/N/A <input type="checkbox"/> STAC Card <input type="checkbox"/> General (Safe) Work <input type="checkbox"/> Hot (Heat/Spark) Work <input type="checkbox"/> Hot (Electrical) Work <input type="checkbox"/> Excavation Work <input type="checkbox"/> Confined Space Entry <input type="checkbox"/> Initial (Live) Entry <input type="checkbox"/> Crane/Critical Lift <input type="checkbox"/> Scaffold Inspection <input type="checkbox"/> Other _____ Y/N/A <input type="checkbox"/> Job scope understood <input type="checkbox"/> Department Information completed <input type="checkbox"/> LOTO verified <input type="checkbox"/> MOC reviewed <input type="checkbox"/> Lines drained/purged <input type="checkbox"/> Low points checked <input type="checkbox"/> Oxygen/Flammability check verified <input type="checkbox"/> Line identification reconfirmed <input type="checkbox"/> Close drains/vents when finished <input type="checkbox"/> Initial entry procedure reviewed <input type="checkbox"/> Confined Space Procedures/Rescue Plan Reviewed <input type="checkbox"/> Tool/Equipment proper for job and in safe condition <input type="checkbox"/> Communicated work with others in area <input type="checkbox"/> Other _____ Y/N/A <input type="checkbox"/> Handrail _____ <input type="checkbox"/> Gloves _____ <input type="checkbox"/> Safety glasses _____ <input type="checkbox"/> Face shield _____ <input type="checkbox"/> Clothing _____ <input type="checkbox"/> Safety shoes _____ <input type="checkbox"/> Ear Plugs _____ <input type="checkbox"/> Air Monitor _____ <input type="checkbox"/> Face protection _____ <input type="checkbox"/> Respirator _____ <input type="checkbox"/> Other _____ Y/N/A <input type="checkbox"/> Work area cleared up <input type="checkbox"/> All red tags released and signed off by individuals <input type="checkbox"/> Permit turned in to permit issuer <input type="checkbox"/> Job status communicated to customer <input type="checkbox"/> Customer's name _____		Today's Date: _____ Time: _____ My Name: _____ My Company: _____ My Foreman/Coach: _____ My Job Location: _____ My Job Description: _____ I have been employed less than 90 days and I am considered an at risk employee. Yes <input type="checkbox"/> No <input type="checkbox"/> The name of my assigned "Buddy" is: _____ List each person in the crew: _____ _____ _____ EMERGENCY INFORMATION <input type="checkbox"/> What is the wind direction? _____ <input type="checkbox"/> Reviewed emergency alarm/phone numbers _____ <input type="checkbox"/> My escape route(s): _____ <input type="checkbox"/> My evacuation assembly point is: _____ <input type="checkbox"/> Location of eye wash/showers station: _____ Foreman/Coach Signature: _____	

Figure: 1B. Sample STAC Card (Back)

LIST OF TASKS	LIST THE HAZARDS FOUND FOR EACH TASK	HOW CAN THE HAZARD BE ELIMINATED? HOW CAN THE HAZARD BE CONTROLLED?
1 _____	1a _____	E1a _____
_____	_____	C1a _____
_____	1b _____	E1b _____
_____	_____	C1b _____
_____	1c _____	E1c _____
_____	_____	C1c _____
2 _____	2a _____	E2a _____
_____	_____	C2a _____
_____	2b _____	E2b _____
_____	_____	C2b _____
_____	2c _____	E2c _____
_____	_____	C2c _____
3 _____	3a _____	E3a _____
_____	_____	C3a _____
_____	3b _____	E3b _____
_____	_____	C3b _____
_____	3c _____	E3c _____
_____	_____	C3c _____
4 _____	4a _____	E4a _____
_____	_____	C4a _____
_____	4b _____	E4b _____
_____	_____	C4b _____
_____	4c _____	E4c _____
_____	_____	C4c _____

Is lifting equipment required to perform this task? Yes ☐ No ☐

Is secondary stopping device needed? (Fail safe) Yes ☐ No ☐

What E/Ring towards end? _____

What secondary stopping device is utilized? _____

Raising/Hardwired in contact? Yes ☐ No ☐

2

1.3.6 Facility Protection Regulations

1.3.6.1 Visitor Entry

Columbia employees Columbia Contractors and Visitors are required to log in upon entrance to the site and log out upon leaving. Cell phone or site radio should be carried by contractors at all times while on site

1.3.6.2 Gambling

All forms of gambling are prohibited on this property.

1.3.6.3 Cameras

In order to take photographs at the Gulfco Marine Maintenance facility, permission must be obtained from the Site Contact.

1.3.6.4 Alcohol, Drugs, Firearms, and Explosives

Any person possessing alcohol or drugs, or who is under the influence of such, will not be permitted to enter the facility or loiter on the property. Testing for alcohol or drug use under certain conditions will be required. Firearms, alcoholic beverages (including empty containers), drugs, or explosives will not be permitted on the property, including the parking areas.

1.3.7 Traffic Regulations

- 1.3.7.1 *Warning Flags*
Red flags will be used on any load that extends beyond the front, side, or rear of any vehicle.
- 1.3.7.2 *Driving and Parking*
Vehicles will not be parked in such a manner as to slow down, hinder, or interfere with the free flow of traffic. Vehicles will not be parked so as to block or interfere with the use of fire hydrants or fire fighting equipment. Vehicles will not be left unattended with the motor running. Vehicles will be backed into parking spaces or parked in a manner where driver can proceed forward from the parked position. Emergency brakes and wheel chocks are to be used when vehicles are parked on a slope.
- 1.3.7.3 *Passengers*
Passengers in vehicles will be limited to the number of seat belts in the vehicle. All vehicle occupants are required to wear seat belts while the vehicle is in motion.
- 1.3.7.4 *Windshield or Window Obstruction*
Vehicles having nontransparent materials which interfere with clear visibility through any side window or windshield will not be operated at the facility. All vehicles will be equipped with adequate rearview devices.
- 1.3.7.5 *Obstructing Streets, Roads, Fire Equipment, or Fire Fighting Facilities*
Except in emergency situations, equipment cannot block roads or streets without permission from the Site Contact. When work obstructs a road or street, approved lights, barriers, warning devices, or signal men will be used. Parked vehicles must not block fire equipment, fire fighting facilities, and fire hydrants.
- 1.3.7.6 *Pedestrians*
- Never run unless you are in immediate danger.
 - Where there are walkways, use them. When you walk on the road, walk on the left facing traffic.
 - Do not use short cuts, especially over objects.
 - Never walk through process units going to or from your workplace without proper safety equipment.
 - Observe traffic closely before you enter and leave vehicles.
 - When going up or down stairways, keep a hand on the handrail.

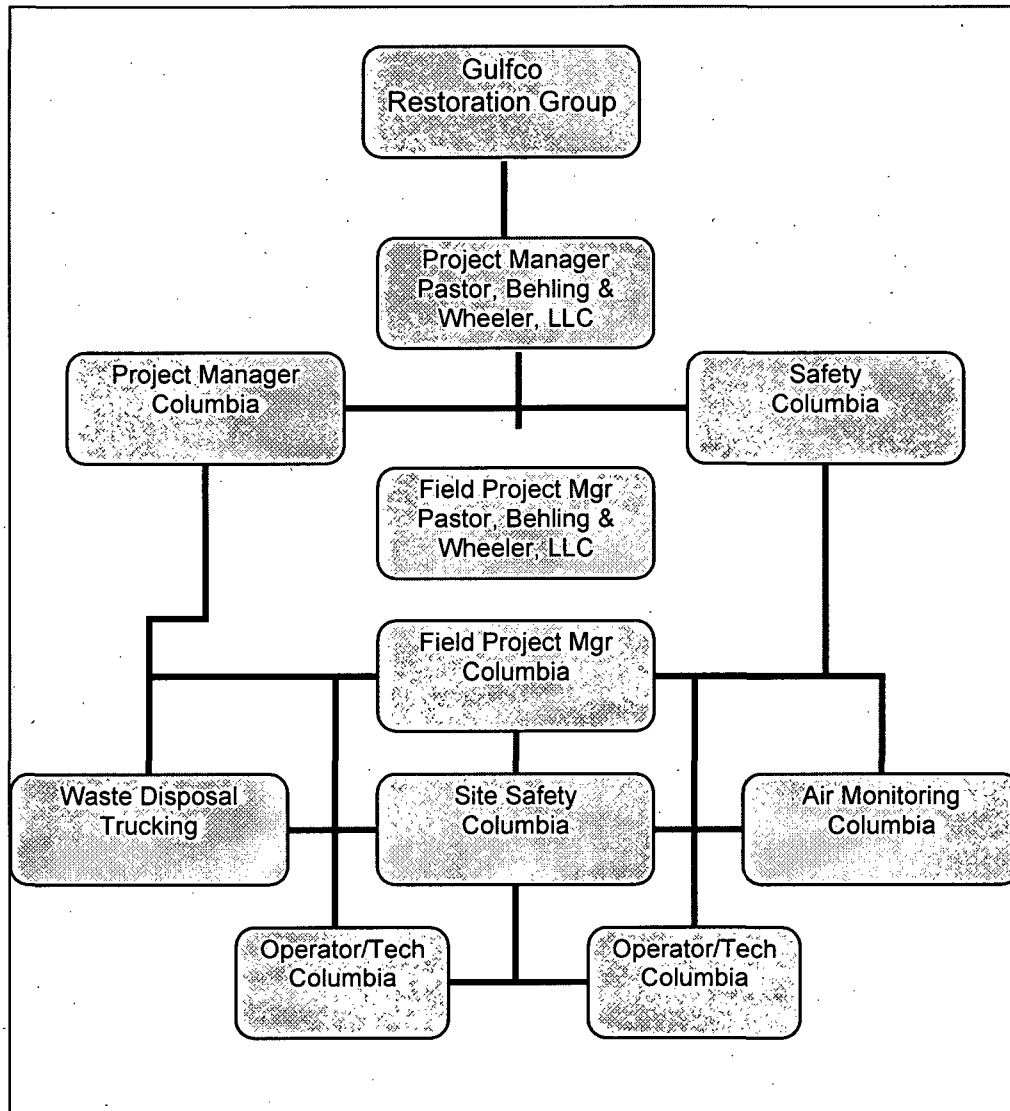
2.0 KEY PROJECT PERSONNEL AND RESPONSIBILITIES

Table-1 includes the roles, names, contact information, and responsibilities of Columbia personnel, Columbia Contractors, and other individuals associated with the health and safety leadership of this project. A diagram showing the relationship of these individuals in the project health and safety organization is shown in Table1 and Figure 2A.

TABLE 1: Key Project Health & Safety Personnel

Role	Person	Contact Information	Responsibilities
Columbia HS and E	Brett Woods	Office: 713-400-5646 Mobile: 713-817-8049 E-mail: bwoods@columbiaenviro.com	Final authority in approving the HASP and ensuring that the project team is supplied with the training, equipment and materials necessary for a safe work environment. Implementing the requirements of the Columbia Health & Safety Program on this project and maintaining management awareness of the project's health and safety status.
Columbia Field Supervisor	Robert Beltran	Cell: 281-740-9854	The execution of the management of the demolition portion of the project, including health and safety leadership and performance on the job site.
Columbia Field Supervisor	Robert Beltran	Cell: 281-740-9854	The execution of the field portion of the project, including health and safety leadership and performance on the job site.
Columbia Field Supervisor	Robert Beltran	Cell: 281-740-9854	All health and safety activities and the implementation of the HASP on a day-to-day basis.
Columbia Field Supervisor	Robert Beltran	Cell: 281-740-9854	The development, promulgation, and enforcement of health and safety policies.
Columbia Field Supervisor	Robert Beltran	Cell: 281-740-9854	Assist in the recognition, evaluation, and control of hazards associated with the site.
Columbia Field Supervisor	Robert Beltran	Cell: 281-740-9854	Information resource related to all aspects of demolition/remediation of ASTs.
Medical emergency:	911 Dispatch	Office: 911	If medical assistance is necessary and the situation is potentially life-threatening (ambulance needed), contact local emergency assistance by dialing 911. Follow-up this call by notifying
Contractor Contact	Tony Maag	Office: 713-400-5651 Mobile: 281-740-6607 E-mail: tmaag@columbiaenviro.com	Waste Support
Local First Responders	Fire, ambulance, Police	Office: 911	All local responders are on 911 system
Local Hospital	Brazosport Memorial Hospital	100 Medical Drive, Lake Jackson, TX	Will Locate Closer to Date of Start

Figure: 2A



3.0

EMPLOYEE TRAINING

All Columbia and Columbia Contractor personnel working on-site (including their on-site supervisors) who may be exposed to hazardous substances, health hazards, or safety hazards will not be permitted to participate in or supervise field activities until they have been trained to a level required by their job function and responsibility. Prior to mobilization or on site, all site workers are required to have the following training:

- Training to familiarize all site personnel with Dow's STAC (safety task analysis card) training used by Dow to control safety risks during completion of projects. Ref.(**Figure: 1A Figure: 1B**)
- Training meeting the requirements of 29 CFR 1910.120 or 29 CFR 1926.65 (as applicable), **Hazardous Waste Operations and Emergency Response (HAZWOPER)** as appropriate for those persons involved in remediation activities.
- Training meeting the requirements of 29 CFR 1910.146, 1926.21(b) (6) (as applicable) **Confined Space Entry** as appropriate for those persons involved in Confined Space activities.
- Training meeting the requirements of 29 CFR 1910.134 (as applicable) **Respiratory Protection** as appropriate for those persons involved in or may be occupationally exposed to respiratory hazards.

Medical surveillance requirements including recognition of symptoms and signs which might indicate overexposure to hazards

The Columbia PM will verify that site personnel have received all appropriate training as required by this HASP prior to their arriving on-site. Verification will consist of reviewing written training documentation such as copies of training certificates or cards issued by / provided by the contractor. Copies of the written training documentation will be retained in the project file. No personnel will be allowed to work at the site unless said training documentation is available.

Once on-site, all site workers will receive training covering, at a minimum, the following:

- Names of personnel and alternates responsible for site safety and health;
- Safety, health and other hazards present on the site;
- Use of PPE;
- Site specific work practices by which the employee can minimize risks from hazards;
- Safe use of engineering controls and equipment on the site;
- Recognition of symptoms and signs which might indicate overexposure to hazards;
- Site specific incident reporting procedures; and
- Site specific emergency procedures.

4.0

FIELD ACTIVITIES

4.1

MAJOR PROJECT TASKS

Major tasks to be performed by Columbia personnel and/or Columbia Contractors include the following:

- Scope Item 1 – Tank Sampling and Analyses
- Scope Item 2 - Mobilization/Demobilization
- Scope Item 3 - Accumulated Water Management
- Scope Item 4 – Tank Contents Removal
- Scope Item 5 – Tank Decontamination
- Scope Item 6 – Waste Transport and Management
- Scope Item 7 - Container and Associated Material Removal
- Scope Item 8 - AST Area Decontamination
- Scope Item 9 - Debris Removal
- Scope Item 10 - Reporting

Each of the High Risk tasks above has a Job Hazard Analysis (JHA) prepared for it. JHAs are further described in Section 5.1, below.

4.2

SITE PERSONNEL JOB TASKS & CERTIFICATION REQUIREMENTS

Workers with the following job descriptions will be engaged in activities conducted in at the site.

Tractor Operator - The tractor operator must have knowledge and be able to operate the tractor safely. The tractor is used to remove surface vegetation. This work is performed approximately eight hours per working day.

Trackhoe (excavator) Operator - The trackhoe operator operates the trackhoe from within an environmentally controlled cab. The machine may be equipped with bucket, hydraulic shear, grapppler or other appropriate attachment to perform excavation and/or demolition activities as described in the scope of work. The work is performed approximately eight hours per working day but the workday may be longer depending on daylight conditions.

Truck Driver - The truck driver operates the vehicle from the cab. Trucks are utilized for hauling demolition debris from the site. The trucks may also be utilized within the site for hauling material to staging or holding areas, if necessary. The work is performed approximately eight hours per working day.

Laborers – Field laborers will be utilized during completion of all work activities. In addition to providing assistance where needed for those activities listed in Section 4.1, other work duties will include, but are not limited to, construction of site structures (decon pad, trailer set up/renovation), cutting, operation of pumps, equipment decontamination, and general site and equipment upkeep and maintenance.

Technical Personnel - This group includes personnel serving in various supervisory and data collection functions ranging from management to inspection to sample collection.

Other visitors to the site not directly involved in proposed work activities (i.e., various carriers and contractors) will be considered in the HASP as technical personnel listed above.

5.0 HAZARD IDENTIFICATION AND CONTROL

5.1 JOB HAZARDS ANALYSES

Prior to initiating any new project activity or when there is a change in site conditions, the Site Safety Officer (SSO) will assist project team members in completing a Job Hazard Analysis (JHA). The JHA will list the job steps; hazards associated with the project activity as well as associated control strategies. A Site-Specific General Hazard JHA and blank JHA form are included in Appendix C.

5.2 STANDARD OPERATING PROCEDURES

Columbia has Standard Operating Procedures (SOPs) that define the minimum requirements for controlling hazards related to the work and surroundings. SOPs are referenced as appropriate on the JHA forms. Copies of the SOPs that have been identified as pertinent to the hazards inherent in the work for this project have been included in Appendix D. These SOPs will be used to guide the development of JHAs by Columbia personnel and Columbia Contractors.

5.3 SUBSURFACE CLEARANCE

Columbia follows subsurface clearance (SSC) requirements to reduce the likelihood of site personnel striking subsurface structures during ground disturbance activities.

Subsurface disturbance below slab or grade level is not anticipated. However, all demolition activities that may disturb areas at or slightly below grade, such as slab removal etc. will be performed only after completing subsurface clearance locate and using the utmost care with attention to identifying potentially buried materials in the soil.

5.4 BEHAVIOR-BASED SAFETY

Everyone on site as part of this project will make a commitment to work safely and to look out for others on the job site. The Loss Prevention Program and associated tools will be employed to manage safety risks on site.

5.5 STOP WORK AUTHORITY

It is Columbia's policy that all site personnel have the authority, without fear of reprimand or retaliation to:

- **Immediately** stop any work activity that presents a danger to the site team or the public; and
- Get involved, question and rectify any situation or work activity that is identified as not being in compliance with the HASP or with broader Columbia health & safety policies.

All site personnel are empowered to identify and correct unsafe acts and conditions before they can cause a Near Miss or Incident (see Section 13). The overriding policy for all workers on site is:

You see it, you own it!

5.6 WORK PERMIT SYSTEM

As an inactive facility, there is not a formal safe work permit. However, per Columbia requirements, work may not be conducted until appropriate notifications to the Columbia PM have been made, applicable Columbia forms, permits are completed, and JHA for high risk tasks to be conducted are in place.

To that end, prior to beginning work each day, Columbia will notify the Gulfco PM and verify Columbia forms and JHAs for the various activities are complete. Depending on the work activities scheduled for that day and site requirements, additional checklists may be required. Copies of the checklists and forms can be found in Appendix B.

5.7 CHEMICAL, BIOLOGICAL AND PHYSICAL HAZARDS

5.7.1 CHEMICAL HAZARDS

Chemicals may be introduced into the body by ingestion, inhalation, or absorption through the skin. Since not all chemicals have the same level of toxicity, the length of time for the exposure and the concentration of the chemical are important in determining the risk. Inhalation and skin contact are the most common routes of entry. Chemicals can be introduced into the body by ingestion when chemicals present on the hands are transferred to food or cigarettes. ASTs and their documented contents are shown on Table I.

The ASTs may contain water, various organic phases, oily sludges, sand, rust solids, and debris as identified in the past by others during work conducted between 1999 and 2006. Others previously identified the ASTs' chemical contents as: benzene; chloroform; 1,2-dichloroethane; trichloroethylene; tetrachloroethylene; vinyl chloride; and petroleum hydrocarbons in various concentrations. The constituents of concern listed in Table 5-1 may be encountered at the site. Material Safety Data Sheets (MSDS) for the constituents of concern are located in Appendix E.

TABLE 5-1: Constituents of Concern

benzene	chloroform
1,2-dichloroethane	trichloroethylene
tetrachloroethylene	vinyl chloride

Table 5-2 shows chemicals that are routinely used by Columbia at the site as part of the project. The MSDS for these chemicals are located in Appendix G.

TABLE 5-2: Chemicals Used for Project Execution

- | | |
|-----------------|---|
| • Gasoline | • |
| • Diesel | • |
| • Hydraulic Oil | • |
| • | • |

5.7.2 BIOLOGICAL HAZARDS

The facility may have snakes and several areas of roosting birds and accumulated bird droppings. Bird droppings may contain a disease agent known as Histoplasmosis.

Histoplasmosis is a disease caused when airborne spores of the fungus *Histoplasma capsulatum* are inhaled into the lungs, the primary infection site. This microscopic fungus, which is found throughout the world in river valleys and soil where bird or bat droppings accumulate, is released into the air when soil is disturbed by plowing fields, sweeping chicken coops, or digging holes. Histoplasmosis is often so mild that it produces no apparent symptoms. Any symptoms that might occur are often similar to those from a common cold. In fact, if you had histoplasmosis symptoms, you might dismiss them as those from a cold or flu, since the body's immune system normally overcomes the infection in a few days without treatment. However, histoplasmosis, even mild cases, can later cause a serious eye disease called ocular histoplasmosis syndrome (OHS), a leading cause of vision loss in Americans ages 20 to 40.

5.7.3 PHYSICAL HAZARDS

The facility has been abandoned for several years. Per OSHA requirements, if necessary an engineering survey will be conducted by a professional engineer to verify the structural integrity of the buildings. However, care should be taken when accessing buildings, platforms, stairs and ladders as conditions are subject to change. In addition, once demolition begins the structural integrity of the facilities will be compromised as the facilities are demolished. Workers must be constantly aware of their surroundings and operating heavy equipment. Workers must stay clear of restricted areas where demolition is taking place.

5.8 AMBIENT AIR MONITORING

Ambient and personnel air monitoring will be conducted by the SSO to assure the proper selection of engineering controls, work practices, and PPE. Additional monitoring will be conducted under any of the following circumstances.

- Work begins on a different portion of the site;
- Change in job tasks;
- Change in weather;

- Change in ambient levels of hazardous constituents as indicated by the sense of smell or changes in the physical appearance of the soil or ground water;
- When new hazardous substances are encountered; and
- During high-risk operations (e.g. drum opening, tank breaching, piping demolition, or handling of leaking drums, or when working in areas with obvious liquid contamination).

Air monitoring will be conducted using direct-reading real-time and other instruments as indicated in Table 5-3. If more than one instrument is listed, either instrument may be chosen. Not all work at the site will require air monitoring for all contaminants. During the mobilization phase of a particular project task or activity, either the PM in consultation with the SSO will determine what contaminants may be encountered in order to have the appropriate instrumentation on-site. The Project Health and Safety Consultant review the determination and assist the PM and the SSO in determining the appropriate instrumentation.

TABLE 5-3: Ambient Air Monitoring Instruments

Constituent	Instrument
Organics	OVM Model 580B with 10.6 eV lamp or MiniRae 2000 with 10.6 eV lamp or equivalent – if you are unsure what kind of organic vapor monitor to use based on the contaminants of concern; contact your OpCo H&S representative. Remember, straight chain hydrocarbons do not register well on PID units and a FID may be required.
Benzene	Drager pump with 0.5-10 ppm tube (SKC part number 800-01841 or RAE PGM7200 UltraRAE Benzene Monitor and : NIOSH 1500 Time Weighted Average (TWA) method for personnel
Dust	MIE PDR 1000 Personal DataRAM Aerosol Monitor, TSI Side Pak or equivalent aerosol monitoring device.

Direct reading instrumentation will be calibrated daily / per manufacturer's instructions. Cylinders of the appropriate calibration gas will be required for fieldwork lasting longer than one day.

Under stable site conditions, ambient air monitoring may be conducted at least once every two hours in the workers' breathing zone and at other locations based on the judgment of the SSO or the Project H&S. Ambient air monitoring results will be recorded on the Ambient Air Monitoring Form found in Appendix I. If site conditions become unstable or change dramatically ambient air monitoring will be conducted more frequently based on the professional judgment of the SSO, the Project H&S or the PM.

Table 5-4 outlines the steps to be taken by the SSO when the action levels of the various contaminants are exceeded. Respiratory protection is selected based on

occupational exposure limits of the constituents at the site and the potential for exposure to vapors and dust from site activities.

TABLE 5-4: Action Levels and Response Actions Requirements

Chemical	Action Level	Response Actions
Organics	<p>PID reads 0.5 ppm sustained in the breathing zone for 1 minute</p> <p>PID reads ≥ 0.5 ppm sustained in the breathing zone for 1 minute</p>	<p>Stop work and workers leave immediate area</p> <ul style="list-style-type: none"> • SSO evaluates need for Tyvek coveralls, dons half-face respirator with organic vapor cartridges and monitors again after allowing vapors to dissipate. • Verify presence or absence of benzene using Dräger pump or UltraRAE Benzene monitor. If Benzene is NOT present go to next bullet. IF BENZENE IS PRESENT GO TO THE BENZENE ROW OF THIS TABLE. • If readings are ambient, resume work. • If readings are 50 ppm or greater, resume work wearing half-face respirators with organic vapor cartridges and Tyvek coveralls if required • Stop work and workers leave immediate area. • Contact PM and Project H&S Consultant. • Evaluation work practices and assess engineering controls to reduce airborne concentrations. • SSO waits 15 minutes, evaluates need for Tyvek covers, dons half-face respirator with organic vapor cartridges, approaches work area slowly, if PID reaches 500 ppm, back out and wait an additional 15 minutes before repeating monitoring.
Benzene or Vinyl Chloride, Chloroethylene, Chloroethene	If BENZENE or VC is present in concentrations equal to or less than 0.5 ppm sustained in the BZ	<ul style="list-style-type: none"> • Don half mask respirator equipped with organic vapor cartridges and continue work with continuous Benzene monitoring.
Benzene or Vinyl Chloride, Chloroethylene, Chloroethene	If BENZENE or VC is present in concentrations equal to or greater than 5 ppm sustained in the BZ	<ul style="list-style-type: none"> • STOP WORK – exit work area – contact Project H&S consultant for guidance on appropriate work practices to continue.

6.0

PERSONAL PROTECTIVE EQUIPMENT

As a Columbia site, minimum PPE at Gulfco Marine Maintenance includes hard hat, safety glasses with side shields, steel-toed footwear, and high visibility clothing. Beyond these minimum requirements, the level of PPE selected for a task is based on the following:

- Type, measured concentration, and toxicity of the chemical substance in the ambient atmosphere;
- Potential for exposure to substances in air, splashes of liquids, or other direct contact with material due to work being done; and
- Knowledge of chemicals on-site along with properties such as toxicity, route of exposure, and contaminant matrix.

In situations where the type of chemical, concentration, and possibilities of contact are not known, the appropriate level of protection must be selected based on professional experience and judgment until the hazards can be better identified.

In addition to summarizing the general PPE requirements for tasks performed at the site, Table 6-1 also serves as the written certification that the PPE Hazard Assessment has been conducted. In addition, PPE requirements will be defined as part of every newly developed JHA. The signature page containing the client's name, project name and number, date and signatures of the parties responsible for the development of the HASP also serve as part of the written certification.

6.1

RESPIRATORY PROTECTION

The type of respiratory protection required will be based on the results of ambient and personnel air monitoring, the results of any models used to predict air concentrations, and the professional judgment of the SSO and the Project Health and Safety Consultant. Respiratory protection requirements are outlined on Table 5-4, above.

As required by 29 CFR 1910.134, *Respiratory Protection*, a cartridge change-out schedule will be developed based on either the results of air monitoring, the results of any models used to predict air concentration, the professional judgment of the Project Health and Safety Consultant and the results of the *North esLife Service Life Estimation Program*. Although North respiratory protection devices may not be worn, the results generated by the *esLife Service Life* software serve as a point of reference in determining the cartridge change-out schedule.

TABLE 6-1: Personal Protection Equipment Requirements

PPE Level	Ensemble Components	Anticipated Use
<p>Level D</p> <p>Should be worn only as a work uniform and not in any area with respiratory or skin hazards. It provides minimal protection against chemical hazards.</p>	<ul style="list-style-type: none"> • Long pants and shirt with sleeves • Steel-toed footwear • Safety glasses with molded side shields • Hard hat • General purpose work gloves if task does not involve water or wet materials • Hearing protection (as required by JSA) • High visibility clothing/PPE 	<p>General site activities associated with demolition.</p>
<p>Modified Level D</p>	<p>Level D and the following:</p> <ul style="list-style-type: none"> • Disposal Tyvek or Saranex coveralls. • Safety-toed rubber boots or disposal boot covers over shoes. • Appropriate chemical resistant gloves as specified in JSA. 	<p>During site activities where potential chemical contact may occur e.g. if contact with contaminated soil or groundwater is possible. Can be worn voluntarily when muddy conditions are prevalent.</p>
<p>Level C</p> <p>Should be worn when the criteria for using air-purifying respirators are met, and a lesser level of skin protection is needed.</p>	<p>Level D or Modified Level D and the following:</p> <ul style="list-style-type: none"> • Half-face air purifying respirator with combination organic vapor or P-100 cartridges. 	<p>Organic vapor cartridges if potential for organic contact. P-100 if contact with airborne ACM fibers is possible.</p>
<p>Level B</p> <p>Should be worn when the highest level of respiratory protection is needed, but a lesser level of skin protection is needed.</p>	<p>Not anticipated to be required May be required when dealing with vessels and piping; If required, appropriate PPE will be specified in applicable JSA</p>	<p>Tasks requiring Level B PPE are not anticipated during this project. If Level B PPE is needed, as determined by the SSO and/or the Project Health and Safety Consultant, the HASP will be revised.</p>
<p>Level A</p> <p>Should be worn when the highest level of respiratory, skin, and eye protection is needed.</p>	<p>Not anticipated to be required</p>	<p>Tasks requiring Level A PPE are not anticipated during this project. If Level A PPE is needed, as determined by the SSO and/or the Project Health and Safety Consultant, the HASP will be revised.</p>

7.0

MEDICAL SURVEILLANCE

All Columbia employees are enrolled in a medical surveillance program. All employees receive an initial medical examination and consultation prior to assignment to any job site. In addition, employees receive an annual medical examination, a medical examination upon termination of employment, and a medical examination when the employee exhibits signs or symptoms relating to possible overexposure to hazardous substances or when an injury or exposure above published exposure limits has occurred in an emergency situation.

Additional medical surveillance will be provided for employees who:

- Are or may be exposed to hazardous substances or health hazards at or above published exposure levels for these substances for 30 days or more a year.
- Wear a respirator for 30 days or more a year or as required by 29 CFR 1910.134, *Respiratory Protection*; or
- Are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.

Additional medical surveillance will be provided for employees who are injured, become ill or develop signs or symptoms due to possible exposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.

8.0 SITE INFRASTRUCTURE, CONTROL, AND GENERAL RULES

8.1 INFRASTRUCTURE

8.1.1 Smoking and Eating Areas

Smoking will only be allowed in designated areas. Upon mobilization at the site, the SSO will establish smoking areas per site-specific or client-specific requirements. Individuals caught smoking outside the designated smoking areas will be subject to disciplinary action up to and including immediate termination.

Upon mobilization at the site, the SSO will establish eating and break areas per site-specific or client-specific requirements. Eating will only be allowed in the designated areas and the areas will be maintained in a clean and sanitary condition. Employees will wash their hands before entering eating areas.

Upon mobilization to site, a site map showing the designated areas will be developed, included in the HASP and posted at the site.

8.1.2 Sanitation and Potable Water

Containers used for drinking water will be equipped with a tap and capable of being tightly closed. In addition, the container will be labeled as "Drinking Water" or "Potable Water." Disposal cups will be stored in a sanitary condition and a receptacle for disposing of the cups will be near-by.

Potable and non-potable water containers and portable toilets (if used) will comply with OSHA 29 CFR 1910.141 requirements. Non-potable water containers will be labeled "Non-potable water, Do not drink"

8.1.3 Temporary Facilities

There will be temporary facilities installed for the project and additional details will be developed upon completion of the project work plans.

8.1.4 Safety Equipment

A first aid kit containing first aid items for minor incidents only and a fire extinguisher is maintained in each of Columbia's vehicle. First aid equipment and a fire extinguisher are also located at the site office.

Eye wash stations will be located based on location of demolition activities. Upon mobilization to site, a site map showing the designated locations will be developed, included in the HASP and posted at the site. Locations will be reviewed at each tailgate safety meeting.

8.1.5 Communications

Cellular telephones and radios will be used for communication between the project teams and the client. However, cell phones cannot be used while operating equipment or while driving any type of vehicle. Two-way radios will be utilized for communication between project team members.

8.2 SITE CONTROL

The site is entirely fenced. Columbia employees and Columbia Contractors are required to log in upon entrance to the site and log out upon leaving. Cell phone (with an extra battery if alone) or site radio should be carried by contractors at all times while on site. Any equipment or material leaving Gulfco property must have previous arrangements.

8.3 GENERAL SITE RULES

The following general rules will be adhered to at all times:

- All personnel entering the site must check in with Columbia site security.
- All individuals entering the site must demonstrate to the SSO that they have been adequately trained as defined in Section 3.
- All individuals must be familiar with emergency communication methods and how to summon emergency assistance.
- Use of alcoholic beverages before, during operations, or immediately after hours is absolutely forbidden. Alcohol can reduce the ability to detoxify compounds absorbed into the body as the result of minor exposures and may have negative effects with exposure to other chemicals. In addition, alcoholic beverages will dehydrate the body and intensify the effects of heat stress.
- Horseplay of any type is forbidden.
- All unsafe conditions will be immediately reported to the SSO, who will document such conditions in the field log. The SSO will be responsible for ensuring that the unsafe condition is corrected as quickly as possible.
- No smoking, eating, chewing gum or tobacco, taking medication, or applying cosmetics in the general demolition area, Contamination Reduction Zone or the Exclusion Zone. Wash hands and face thoroughly prior to conducting the activities in the Support Zone.
- Smoking, matches, and lighters are only allowed in the designated smoking area.
- Avoid contact with potentially contaminated substances. Avoid, whenever possible, kneeling on the ground, or leaning or sitting on trucks, equipment or the ground. Do not place equipment on potentially contaminated surfaces.

- If PPE becomes torn or saturated with contaminated material, immediately leave the Exclusion Zone, go through the decontamination steps, and replace the affected PPE. Additionally, wash any exposed skin thoroughly with soap and water.
- The SSO will be responsible for determining what site work can be performed safely in the rain and at what point work will cease due to either quality or safety issues. In the event of thunder and/or lightning, all work will be suspended until 30 minutes have elapsed from the last clap of thunder or flash of lightning. During rain, lightning and/or thunder events, site workers should seek shelter in either a building or vehicle. In the event of a tornado, site workers should seek shelter in a designated shelter building. Trailers, should not be used as a shelter in the event of severe weather

9.0

DECONTAMINATION PROCEDURES

Decontamination involves the orderly controlled removal of contaminants from both personnel and equipment. The purpose of decontamination procedures is to prevent the spreading of contaminated materials into uncontaminated areas. All site personnel should limit contact with contaminated soil, ground water or equipment in order to reduce the need for extensive decontamination.

Equipment and materials used in the decontamination process may include the following:

- High pressure/hot water cleaning using only potable water/fire water;
- Five-gallon bucket;
- Potable water;
- Distilled water;
- Paper towels; and
- Brushes.

9.1

PERSONNEL DECONTAMINATION

The following procedures will be utilized for personnel decontamination:

1. Clean rubber boots with water;
2. Remove all PPE and dispose of the PPE in the designated drums; and
3. Wash hands and any skin that may have come in contact with affected soil or ground water with moistened disposable towels, such as baby wipes, or soap and water.

9.2

EQUIPMENT DECONTAMINATION

The following will be required for equipment and tool decontamination:

- Before leaving the work area, excess contamination will be removed from the equipment and tools and placed in approved, properly labeled containers.
- A decontamination area will be designated for cleaning all equipment that has been in contact with the site materials before leaving the site. All decontamination will be conducted on a pad with an impermeable synthetic liner and fluid-containment boom. Equipment will be placed on the pad and rinsed, brushed and/or steam cleaned to remove any contamination.
- Disposal of fluids generated from the decontamination process will be in accordance with approved work plans.
- Disposal of all solids collected within the decontamination pad and the pad liner will be in accordance with approved work plans.
- For major equipment, utilize a soap and/or water rinse and steam cleaning with temperature between 160 degrees to 180 degrees Fahrenheit with a pressure at or greater than 1,200 pounds per square inch (psi) as a minimum required procedure.

10.0 SPILL CONTAINMENT PROGRAM

The spill contamination program for this project will involve the use of preventative measures in order to reduce the potential for environmental releases. These preventative measures will include the following:

- Equipment inspection;
- Staging equipment on containment pads;
- Secondary containment for fuel storage tanks; and
- General housekeeping practices.

If project activities involve the use of drums or other containers, the drums or containers will meet the appropriate DOT regulations and will be inspected and their integrity assured prior to being moved. Operations will be organized so as to minimize drum or container movement. Drums or containers that cannot be moved without failure will be over-packed into an appropriate container.

10.1 DIESEL TANKS

All portable diesel tanks will be supplied by vendor with secondary containment

The containment area will be large enough to hold 125% of the largest container. While the diesel tanks are being filled, at least one person aside from the delivery truck driver will be in attendance. The dispensing nozzle will be an approved automatic-closing type without a latch-open device.

10.2 HYDRAULIC FLUID/ENGINE OIL/FUEL SPILLS

Prior to use of hydraulic equipment, and after fifteen minutes of operation, the equipment will be thoroughly inspected for signs of leaks or wear. In the event of an unexpected release of hydraulic fluid, engine oil, gasoline or diesel fuel, the release material will be absorbed with sorbent pads, which will be placed in a designated drum for disposal. Impacted soil will be excavated and placed on plastic sheeting and covered until characterization and/or disposal can be arranged.

11.0 CONFINED SPACE ENTRY PROCEDURES

- Any conditions making it unsafe to remove an entrance cover will be eliminated before the cover is removed.
- Lockout /Tag out procedures must be followed during a permit-required confined space entry.
- All entrants must wear a safety harness with retrieval rope attached to the d-ring on the back of the harness.
- Note: More often, it is the responsibility of the client to prepare a confined space for entry. Procedures must be developed to ensure that information

concerning the preparation of confined spaces by the client is communicated to Company personnel.

- When entrance covers are removed, the opening will be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects entering the space.
- Before an employee enters the space, the internal atmosphere will be tested, with a calibrated direct-reading instrument, for the following conditions in the order given:
 - Oxygen content,
 - Flammable gases and vapors, and
 - Potential toxic air contaminants.
- The entry supervisor who performs monitoring of the confined space will notify entrants of the potential hazards and monitoring results. Entrants will be involved and participate in the process of reviewing the written permit and signing of the permit.
- Employees or their representatives are entitled to request additional monitoring at any time during the confined space entry operation.
- Individuals will not enter a confined space that is immediately hazardous to life or health. Initial testing to determine potential hazards that require entry will have an approved and documented Standard Operating Procedure with a two-level approval -- one of which must be the Site Superintendent and the other the Company Safety Representative.
- There will be no hazardous atmosphere within the space whenever any employee is inside the space.
- An employee may not enter the space until the forced air ventilation has eliminated any hazardous atmosphere. The forced air ventilation will be so directed as to ventilate the immediate areas where an employee is or will be present within the space and will continue until all employees have left the space. The air supply for the forced air ventilation will be from a clean source and may not increase the hazards in the space.
- The atmosphere within the space will be continually tested to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere and providing sufficient oxygen to the worker.
- If a hazardous atmosphere is detected during entry, each employee will leave the space immediately. The space will be evaluated to determine how the hazardous atmosphere developed and measures will be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.
- The entry supervisor will verify that the space is safe for entry and that the pre-entry measures required by this Company program have been taken, through a written certification that contains the date, the location of the space, and the signature of the person providing the certification. The certification will be made before entry and will be made available to each employee

entering the space. This can be accomplished by means of an entry permit provided by the client.

- The Site Supervisor will designate the persons who are to have active roles (as, for example, authorized entrants, attendants, entry supervisors, or persons who test or monitor the atmosphere in a permit space) in entry operations, identify the duties of each such employee, and provide each such employee with the training required by this Company program.
- This Company will provide at least one attendant outside the permit space into which entry is authorized for the duration of entry operations.
- If multiple spaces are to be monitored by a single attendant, include in the permit program the means and procedures to enable the attendant to respond to an emergency affecting one or more of the permit spaces being monitored without distraction from the attendant's responsibilities under this program;
- The Site Superintendent in conjunction with the Company Safety Representative and the client will develop and implement procedures for summoning rescue and emergency services, for rescuing entrants from permit spaces, for providing necessary emergency services to rescued employees, and for preventing unauthorized personnel from attempting a rescue. Emergency equipment must be inspected prior to any entrance into the confined space.
- If an entrant is in need of rescue, the attendant's sole responsibility is to sound the alarm to evacuate any other entrants and summon emergency personnel. Under no circumstance will an attendant enter the confined space by himself.
- Before entry begins, the entry supervisor identified on the permit will sign the entry permit to authorize entry.
- The completed permit will be made available at the time of entry to all authorized entrants, by posting it at the entry portal or by any other equally effective means; so that the entrants can confirm that pre-entry preparations have been completed.
- All entrants must be signed in and out by the attendant every time they enter or exit the confined space.
- The duration of the permit may not exceed the time required to complete the assigned task or job identified on the permit.
- The entry supervisor will terminate entry and cancel the entry permit when:
 - The entry operations covered by the entry permit have been completed; or
 - A condition that is not allowed under the entry permit arises in or near the permit space.

12.0 *EMERGENCY RESPONSE PLAN*

This section describes possible contingencies and emergency procedures to be implemented at the site.

12.1 *PERSONNEL ROLES AND LINES OF AUTHORITY*

The SSO has primary responsibility handling emergency situations. This includes taking appropriate measures to ensure the health and safety of site personnel and the public. The SSO will be responsible for evacuating any person and providing decontamination, and arranging for medical treatment or first aid for any person injured or requiring medical attention.

Possible actions may involve the evacuation of personnel from the site area and ensuring that corrective measures have been implemented, appropriate authorities notified, and follow-up reports completed. If the SSO is not available, the CM will assume the SSO's responsibilities. All site personnel will assist as directed by the SSO in case of an emergency.

12.2 *EMERGENCY ALARMS*

As a non-operating facility, Site does not have specific alarms for fire. In the event of a fire during this project, site security will activate a series of four blasts of an air horn indicating the need to evacuate. Evacuate using established evacuation routes in an upwind or crosswind direction as noted in site drawings.

12.3 *EVACUATION PROCEDURES AND ROUTES*

The evacuation routes can be found on the attached Site Map (Appendix A)

In the event of an emergency requiring evacuation to an Assembly Point, the SSO will be responsible to account for the presence of all project team members and subcontractors on-site at the time of the emergency. When evacuating, it is important to be aware of the prevailing wind direction and evacuate upwind or crosswind.

12.3.1 *Assembly Points*

To be clearly evaluated depending on site conditions while on-site.

12.4 *RESPONDING TO EMERGENCIES*

In the event of an actual or suspected incident where personal injury or illness occurs, the SSO should take the following actions sequentially as listed:

- Put on appropriate PPE;
- Remove the exposed or injured person(s) from immediate danger;
- Decontaminate affected personnel as appropriate;
- Obtain ambulance transport to the local hospital in the event of any injury or illness deemed to require medical surveillance or treatment; and
- Evacuate other personnel until it is safe for work to resume.

12.5 *REPORTING EMERGENCIES*

At the earliest time practicable following the occurrence of the emergency situation, the SSO will contact the PM to advise them of the situation. The PM will then be responsible for promptly informing the following parties about the emergency.

- Injured/involved personnel's supervisor;
- Columbia Project manager;
- Project H&S Consultant; and
- Client Contact.

In the case of an Incident, the SSO, with the cooperation of the Columbia PM will promptly begin formal documentation of an investigation into the root causes of the Incident following the occurrence of the incident. This process is defined in Section 13, below.

12.6 *RESTARTING WORK FOLLOWING AN EMERGENCY*

The SSO will determine when it is safe to resume work at the site following an emergency. Note that if there is any doubt regarding the safe condition of the area, work will not recommence until all safety issues are resolved.

12.7 *EMERGENCY CONTACTS*

Contact information for emergencies is provided in the project personnel list in Table 2-1.

12.8

EMERGENCY DRILLS

In accordance with the HAZWOPER Standard emergency response plans will be rehearsed regularly as part of the overall training program for site operations. The frequency of this drill (rehearsal) is outlined on Table 12-1. All drills will be documented on the Emergency Drill Evaluation Form found in Appendix J. Drills do not need to be elaborate. A table-top scenario during the daily safety meeting is an adequate drill.

TABLE 12-1: Emergency Drill Frequency

Project Duration	Drill Frequency
Less than 30 days	None, cover during review/sign-off of HASP
Greater than one month but less than one year	Once
Greater than one year	Annually

13.0

MANAGEMENT AND INVESTIGATION OF INCIDENTS

For purposes of this HASP, an Incident is as an unanticipated negative outcome, which differs from the intended outcome. Incidents fall into two general categories:

- Near Misses, which almost result in an injury, illness, or property damage, but for some fortunate reason does not; and
- Major Incidents, which do result in an injury, illness, or property damage.

The investigation techniques that will be employed for Incidents are described below. Completed investigation forms will be kept in the site health & safety file.

13.1

NEAR MISS, UNSAFE ACT, AND UNSAFE CONDITION REPORTING & INVESTIGATION

Near Misses have the potential to become Incidents, **but for some fortunate reason do not**. Even though a worker illness or injury or property damage does not occur, it is important to understand why Near Misses happen and what can be done at the job site to stop their recurrence. Thus, all site personnel should be vigilant to identify Near Misses, as well as Unsafe Acts and Unsafe Conditions that could lead to a Near Miss or a Major Incident. Notwithstanding the Stop Work Authority described in Section 5.5, site personnel should report the observation of a Near Miss, Unsafe Act, or Unsafe Condition as soon as practicable to the SSO such that:

- Appropriate corrective action can be taken; and
- Important lessons learned can be disseminated to the site team.

The SSO will promptly move to correct Unsafe Acts and Unsafe Conditions after they are reported. Near Misses will be investigated within 24 hours of their occurrence. The SSO will document all Near Misses using the Near Loss/Loss Investigation Form found in Appendix K. Additionally, the SSO, at the discretion of the PM may also document unsafe acts and unsafe conditions using the LPS

Near Loss/Loss Investigation Form. The SSO will track corrective measures to completion, as required. For Near Misses, the initial NLI form must be submitted to the PBW PM within 24 hours of the incident. The final NLI form with root causes and solutions identified must be submitted to PBW within 10 business days.

13.2

INCIDENT REPORTING & INVESTIGATION

Incidents result in worker illness, injury, or property damage. All Incidents should be reported as soon as practicable to the SSO. The SSO will document the Incident using the Near Loss/Loss Investigation Form found in Appendix K. The SSO will complete and forward the NL\LI to the PM within 24 hours of the Major Incident. The SSO and Columbia PM will schedule the investigation and include project supervision (Columbia, Columbia Contractors, and the Client), and the injured/involved employee(s). Root cause analysis will be performed to assess the apparent cause and identify corrective measures to be implemented to prevent re-occurrence. The SSO will track to completion the corrective measures identified during the investigation. The initial LI form must be submitted to the PBW PM within 24 hours of the incident. The final LI form with root causes and solutions identified must be submitted to PBW within 5 business days.

14.0 SITE SAFETY BRIEFINGS

14.1 COMMUNICATION AND REVIEW OF THE HASP

An initial review of the site-specific HASP will be held either prior to mobilization or after mobilization but prior to commencing work at the site to communicate HASP details and answer questions to individuals working at the site.

14.2 DAILY SAFETY MEETING

A daily safety meeting will be conducted each morning. The daily safety meeting will include a discussion of the following health & safety-related topics, among others:

- Who is doing what, where and how;
- The potential for overlapping site operations;
- Changes to the HASP or JHAs;
- Discussion of recent Incidents, safety observations, and
- Comments from the project personnel.

The meetings will be documented on the Daily Safety Meeting form found in Appendix B.

A second, abbreviated safety meeting will also be conducted in the early afternoon or upon returning from lunch breaks. The afternoon safety break should include at a minimum:

- discussions of observations conducted during the day;
- overview of planned tasks for the afternoon; and
- brief overview of JHAs.

Documentation of the afternoon safety break meeting/topics is also required.

15.0**AUDITING AND HASP REVISIONS**

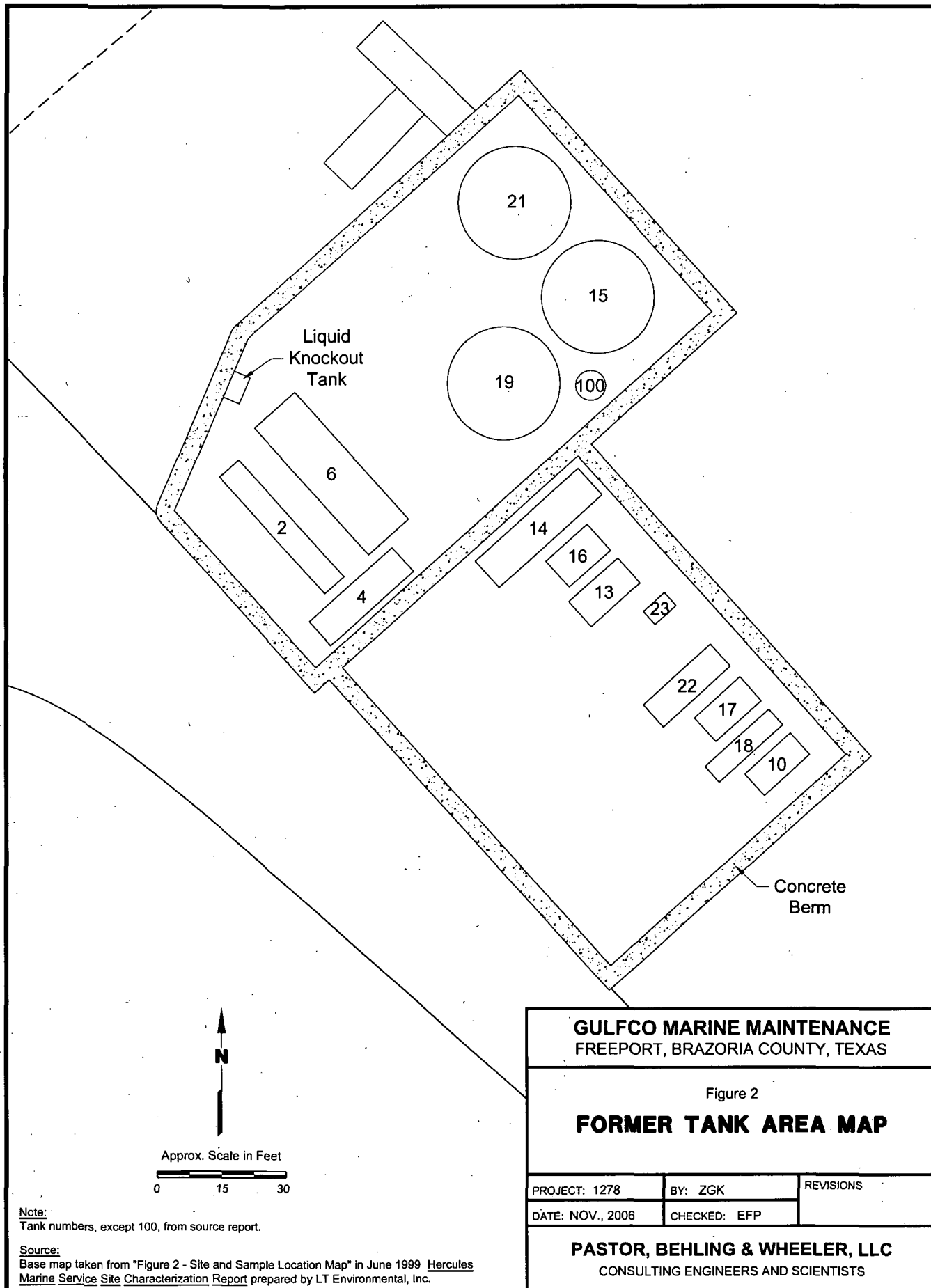
Selected project field activities and project files shall be audited periodically. A full site audit for conformance with the HASP will occur at least once per year for projects with field duration of 1 year or longer. Full site audits may also be conducted for shorter duration projects. Project documentation audits may be conducted periodically for shorter term projects.

Audits may include less formal safety evaluations using a field-oriented checklist or formal compliance audits including field and file documentation verification using a formal audit instrument, customized for the project. Regardless of the type audit instrument, preliminary findings will be shared with site management and audit reports will be sent to the PM and Columbia PM. Corrective actions will be tracked to completion.

Revisions made to the site HASP in response to audit feedback, lessons learned from Incidents, or other reasons will be explained to all site personnel at the first daily safety meeting following the institution of the HASP revision.

Site Location Map and Map to Hospital

Appendix A



GULFCO MARINE MAINTENANCE
FREEPORT, BRAZORIA COUNTY, TEXAS

Figure 2
FORMER TANK AREA MAP

PROJECT: 1278

BY: ZGK

REVISIONS

DATE: NOV., 2006

CHECKED: EFP

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

Note:

Tank numbers, except 100, from source report.

Source:

Base map taken from "Figure 2 - Site and Sample Location Map" in June 1999 Hercules Marine Service Site Characterization Report prepared by LT Environmental, Inc.

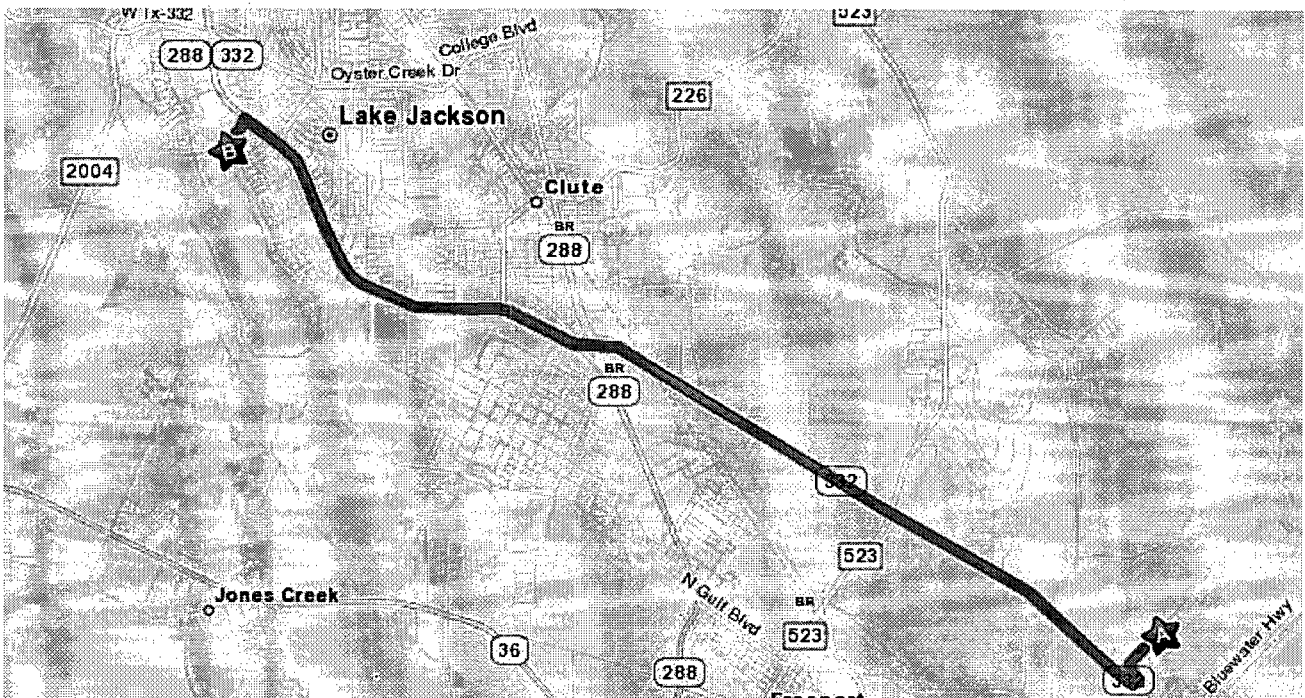
Hospital Information

Brazosport Regional Health System •

100 Medical Drive • Lake Jackson, Texas 77566

(979) 297-4411

1. Start out going SOUTHWEST on MARLIN AVE toward SNAPPER LN.
2. Turn LEFT onto TARPON LN.
3. Turn RIGHT onto SAILFISH ST.
4. Turn RIGHT onto TX-332.
5. Turn SLIGHT RIGHT onto TX-332 W.
6. Turn LEFT onto OAK DR S.
7. Turn LEFT onto MEDICAL DR.
8. 100 MEDICAL DR is on the RIGHT.



Columbia Forms and Checklists

Appendix B



DAILY SAFETY MEETING REPORT

Project#: _____ Date: _____ Time: _____
Project Name: _____ Location: _____
SSO on Duty: _____ Supervisor On Duty: _____
Weather: Temp. Range ____ - ____ Wind Direction/Speed _____

If you are breaking ground make sure a ONE CALL was done.

1-800-DIG-TESS

1-800-344-8377

Today's Work Tasks:

Potential accident or hazards resulting from today's work tasks: _____

Controls used to eliminate hazards: _____

Previous day's safety incidents, observations, near misses, and associated corrective actions, etc.: _____

Previous Day's Monitoring
Results: _____

Other
instructions: _____

SSO Signature: _____ Supervisor Signature: _____

Project: _____

Model: _____

Inspected by: _____ **Date:** _____

☒ Good or N/A for inspection items. Explain any _____

Project No.: _____

ID Number: _____

Date of Inspection:

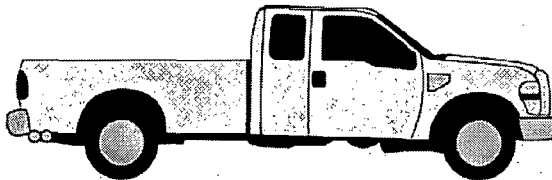
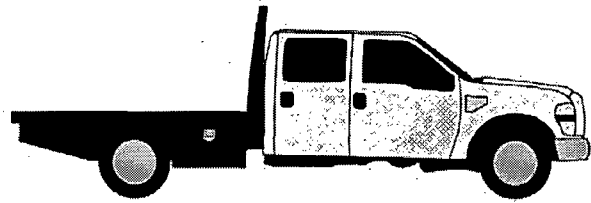
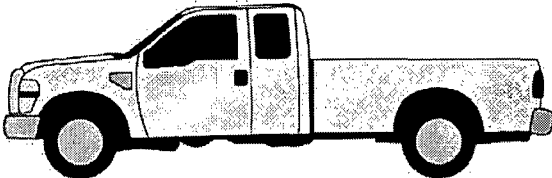
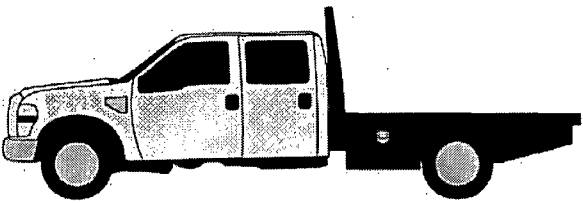
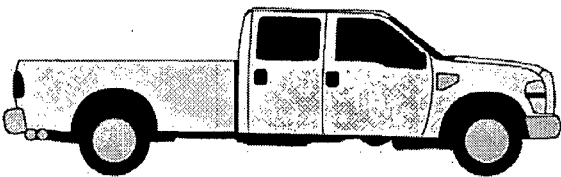
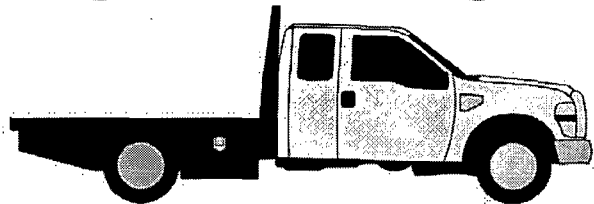
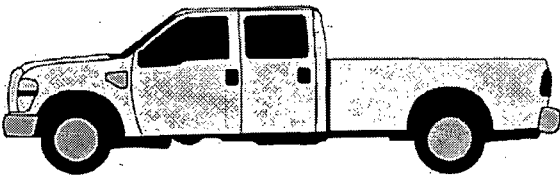
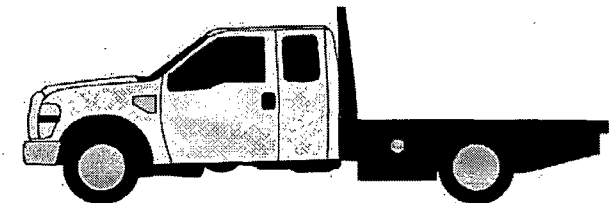
✓, Good or N/A for inspection items. Explain any services, damage, defects, and or attention needed items on lines provided next to inspection checklist.

Description of service/attention needed:

DAILY TRUCK
INSPECTION

Damage Report

Circle damage areas on the truck that you are using, and then give a brief description of damages in the notes section below.



Notes: _____

DAILY TRAILER INSPECTION

Project: _____

Project No.: _____

Model: _____

ID Number: _____

Inspected by: _____

Date of Inspection: _____

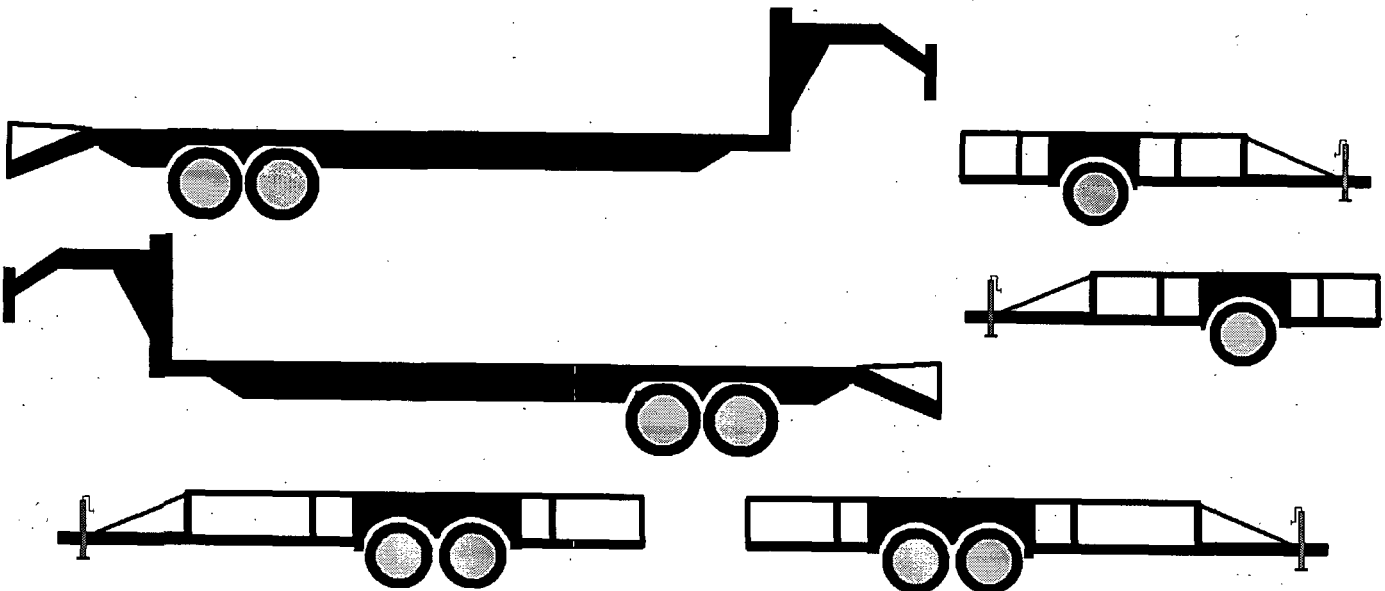
✓, Good or N/A for inspection items. Explain any services, damage, defects, and or attention needed items on lines provided next to inspection checklist.

Description of service/attention needed:

Inspection Item	Good	Attention Needed	N/A
Tires-Tread/Pressure			
Brake Lights			
Turn Signals			
Brakes			
Plugs/Wiring			
Breakaway Safety Kit			
Bed/Running Boards			
Tongue Jack			
License plate			
Inspection			
Ramps			
Chains/Straps			

Damage Report

Circle damage areas on the trailer that you are using, and then give a brief description of damages in the notes section below.



Notes: _____

Project: _____

Equipment: _____

Inspected by: _____ **Date:** _____

Hours out: _____

Descrip

✓, Good or N/A for inspection items. Explain any services, damage, defects, and or attention needed items on lines provided next to inspection checklist.

Project No.: _____

ID Number: _____

Date of Inspection: _____

Hours out: _____ Hours in: _____

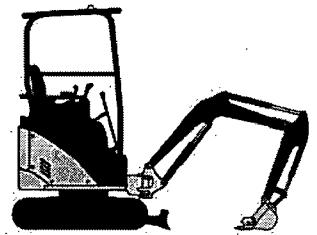
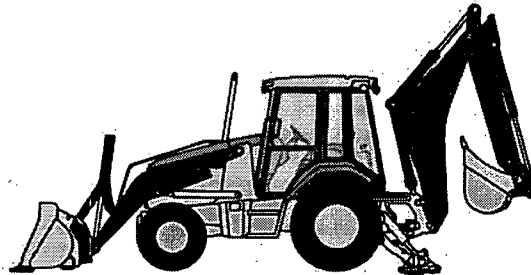
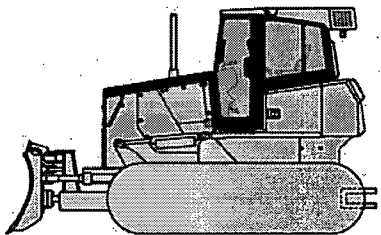
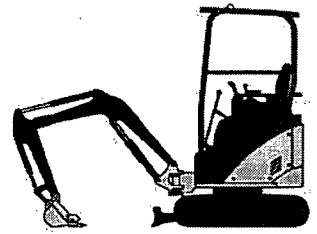
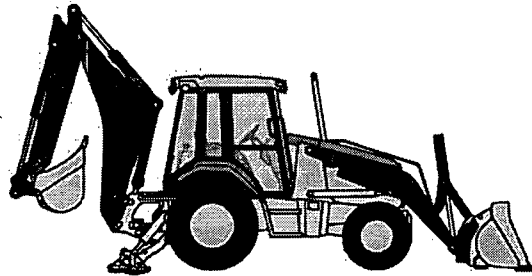
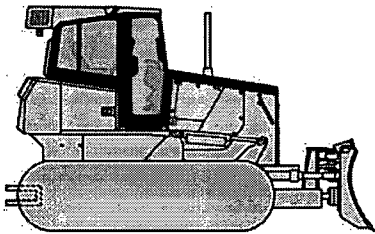
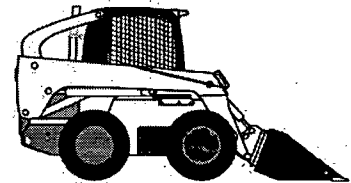
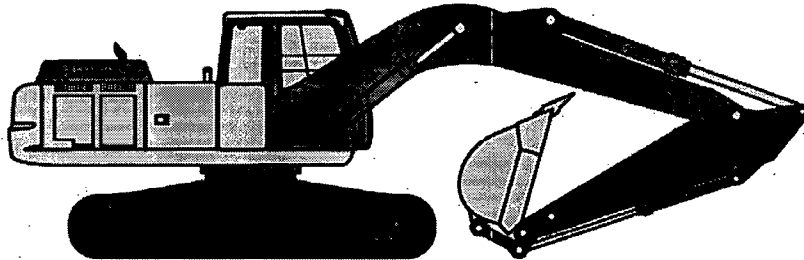
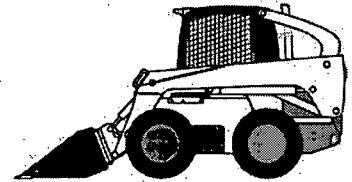
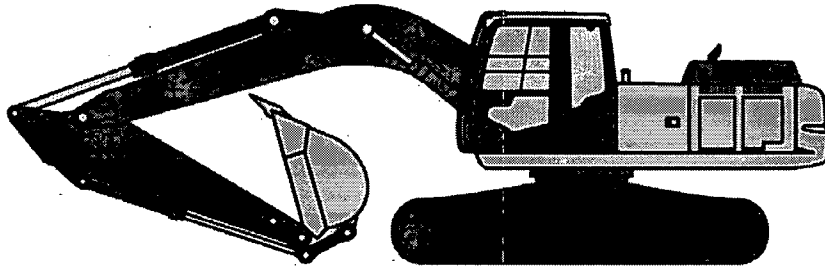
Description of service/attention needed:

[illegible]

DAILY EQUIPMENT INSPECTION

Damage Report

Circle damage areas on the equipment that you are using, and then give a brief description of damages in the notes section below.



Notes: _____

Job Hazards Analyses

Appendix C



Columbia

JOB HAZARD ANALYSIS

JOB TASK: General Site Activities

PROJECT LOCATION: .

DATE: .

Before Beginning Any Activity, ALWAYS Perform SPSSA (Safe Performance Self Assessment)

RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT (PPE): Level D - safety goggles, steel toe, hard hat, safety glasses with side shields, high visibility clothing, cut resistant gloves, long pants and sleeved shirts. PPE Level C (same as level D plus half face respirators, nitrile/latex gloves, Tyvek coveralls, disposable boot covers).

Developers: Brett Woods, Adan Cortez, Greg Blomquist, Jennifer Jonas.

JOB STEP	POTENTIAL HAZARDS	PREVENTATIVE/CORRECTIVE ACTION
Establish/set up site control (traffic control)	Personal injury from contact with vehicles; property damage caused by being hit with a vehicle	Park in a secure area where vehicle is out of traffic pattern so that tailgate safety meeting can be performed safely. Be cautious when parked near active roadways do to flying debris or other material flying off of roadway.
		Identify and mark surface expressions with bright marking paint or flags
		Utilize cones/barricades/safety fence to establish exclusion zone.
		Exclusion zone must be at minimum greater than swing radius of equipment.
		Lower boom and shut equipment off when someone approaches cab to discuss work.
		Heavy equipment should be equipped with back-up alarm or use horn when backing.
		Do not allow personnel to stand within the swing radius of equipment.
		Stay clear of operating equipment and heavy equipment when moving
		Stay clear of operating equipment unless approaching to discuss work approach should be made from the front and within view of the operator making sure of eye contact.
		Wear highly visible clothing such as orange reflective traffic vests or clothing.
		Establish access points in the work zone to keep pedestrians and unintentional traffic out.
		A spotter must be utilized when vehicle is backing or moving onsite to ensure a safe pathway. Prior to any vehicle movement, a discussion must be held with each designated spotter so that they are aware of their responsibility.
		Prior to moving vehicle, all items must be secured, doors, and toolboxes must be closed to prevent contact with objects and to prevent items from falling out in transport.
		Spotters must look up to ensure that there are no overhead wires or structures such as canopies that can be struck and ensure that they can be safely cleared by the operating equipment.
		Look down to identify unusual depressions, holes, or debris that may interfere with backing.
Fall from equipment/vehicles		Observe fixed objects or parked, unoccupied vehicles.
		Back slowly using rear view mirrors frequently spotter must be utilized if visibility is poor.
Potential to cause a fire/explosion by use of cell phones and other electronic equipment		Remain constantly alert at all times while backing for the potential for vehicles or pedestrians to appear unexpectedly in the path of travel.
		Establish truck turnaround routes.
Electrocution. Note: If electrical utilities must be de-energized, locked and tagged out of service, a thorough evaluation must be conducted of the work area to ensure that all electrical service that is required to be de-energized has been deenergized and that no one remains exposed to hazardous electrical energy.		Wear seatbelts at all times.
		Use three points of contact when getting into and out of equipment/vehicles
		All personal electronic devices (i.e., cell phones) are not to be used in the work areas, vehicular traffic areas, or any area where the potential for an explosive environment exists or where cell phone use can distract from your surroundings/ongoing activities.
		Ensure that a 20 lb fire ABC extinguisher is brought to and made available to site personnel surrounding hazards.
		All circuits shall be tested to assure a lockout is in place before work is conducted.
		Lockout/Tagout procedures shall be followed. Only the person who locks/tags a circuit may remove the lock or tag.
		Utilize a spotter during all work in proximity to electrical utilities.
		Work required in close proximity to utilities will require temporary disconnection of power.
		Use only grounded and GFCI-protected circuits with appropriate load capacity.
		All electrical tools and equipment must be grounded or double insulated. Do not remove or disable grounding plugs.
		Inspect equipment, power cords, and three-prong grounding plugs daily; take damaged equipment out of service and tag for repair.
		Do not wear conductive jewelry (e.g., watches, rings).

JOB STEP	POTENTIAL HAZARDS	PREVENTATIVE/CORRECTIVE ACTION
	Parked vehicles/equipment may roll and cause injury and/or property damage	Always engage emergency brake when parking. Chock tires when parking on sloped (greater than 1 foot rise on a path 100 feet long) terrain. Remove keys from ignition when leaving vehicle.
Remove/load equipment from vehicle	Heavy Lifting	<p>When possible, use powered equipment, lift truck, drum cart, or other mechanical means to move heavy items (machine instead of manpower).</p> <p>Do not lift or move heavy materials (>50 pounds) without adequate assistance (team lift) using two people.</p> <p>Use proper bending/lifting technique (bend and lift with legs and arms, not back); position hands away from pinch points or areas where fingers may be crushed. Do</p> <p>Take breaks in addition to scheduled rest periods as needed.</p> <p>Determine travel path and staging area before lifting materials.</p>
Exposure	Weather related issues	<p>Staff should understand and be able to recognize the signs and/or symptoms of cold and hot weather related illnesses.</p> <p>Personnel should dress appropriately for ambient temperatures which would include but not be limited to dry layered clothing.</p> <p>Applying sunscreen to exposed skin is strongly recommended during sunny weather conditions (all seasons) to mitigate sun exposure.</p>
	Cold stress related injury	For cold weather, work schedules should be adjusted to provide sufficient break periods in a heated area.
	Heat stress related injury	<p>For hot weather, work schedules may need to be adjusted to provide time intervals for replenishing fluids.</p> <p>Observe work-rest schedule (as outlined in HASP) to manage heat/cold stresses. Take breaks in addition to scheduled rest periods.</p>
	Dehydration	Personnel should consume at least 8 ounces of cool water or electrolyte replacement drinks every 20 to 30 minutes.
	Personal injury or illness due to exposure to site contaminants/chemicals/materials onsite	<p>Review and understand action levels noted in the HASP.</p> <p>Monitor (evaluate) breathing zone or enclosure of workers if hazardous vapors/atmosphere is suspected.</p> <p>Don appropriate PPE including Tyvek, goggles, nitrile gloves and face shield to protect against dermal contact with site contaminants.</p> <p>Review and follow procedures outlined in MSDS.</p>
	Vapors, Airborne Particulates, and Debris	<p>Approach and stay upwind of potential sources of vapors and dust</p> <p>Operator and ground crew wear appropriate PPE including face shield, goggles, dust mask, cut resistant gloves and long sleeves as necessary.</p> <p>Use water to control dust in area if doing so will not create other hazards on site (slipping, environmental impact, et cetera).</p> <p>Stop work if hazardous conditions identified until precautions are taken.</p> <p>Erect flags for a visual direction and intensity of wind</p>
	Biological Hazards: Insects, Snakes, Wildlife, Vegetation	<p>Inspect work areas upon arrival at site to identify hazards).</p> <p>Landscape site to reduce high grass and stagnant water that create habitats attractive to wildlife and remove hazardous flora.</p> <p>Wear long pants and snake chaps in areas with grass higher than 4 inches. If moving through vegetated areas, use a long-handled tool to disturb vegetation prior to stepping through.</p> <p>Use insect repellent when in areas with grass higher than 4 inches or standing water.</p> <p>Wear protective clothing (bee suits/hood) or use of closed cab equipment if a swarming type of insect is present.</p> <p>Stay 5 feet away from hazardous flora.</p> <p>Prior to beginning work in vegetated areas, survey employees to determine whether they have known sensitivities to hazardous flora and fauna. Reassign sensitive employees to tasks in non-vegetated areas or provide Tyvek to reduce potential for dermal contact.</p> <p>Wash hands and arms immediately with soap and water if skin contacts the plants.</p> <p>Do not antagonize snakes or wild animals.</p> <p>Leave area until animal goes away or call animal control if animal needs to be removed.</p>
Walking Surfaces	Personal injury due to slips, trips, and falls	<p>Maintain all equipment and tools in designated areas and out of pathways.</p> <p>Look for changes in elevation and grade when walking on uneven terrain.</p> <p>Place temporary ramps over hoses or cords leading from water source or power source to designated work zone if no other route is possible.</p>
SIGNED		
Forman	Helpers:	
Other:		



Columbia

JOB HAZARD ANALYSIS

DATE:

JOB#:

PERMIT#:

ISSUED BY:

SUPERVISION/FOREMAN

Consider the following and check the items which apply to the job, then review with the work crew.

PERMITS

- ☐ Required
- ☐ Cold Work
- ☐ Hot Work
- ☐ Entry Permit
- ☐ All Conditions Met
- ☐ Signed Off When Complete
- ☐ Other _____

PERSONAL PROTECTIVE EQUIP. (PPE)

- ☐ Type of Gloves
- ☐ Composition of Gloves
- ☐ Special Purpose Gloves
- ☐ Tyvek Suit
- ☐ Acid Suit /Slicker Suit
- ☐ Rubber Boots
- ☐ Mono Goggles (vented/non-vented)
- ☐ Face Shield
- ☐ Respirator
- ☐ Fresh Air
- ☐ Ear Protection
- ☐ Safety Harness
- ☐ Burning Goggles
- ☐ Other _____

TOOLS

- ☐ Current Inspection
- ☐ Proper Tools for the Job
- ☐ Good Tool Condition
- ☐ Qualifications
- ☐ Other _____

EMERGENCY EQUIPMENT

- ☐ Fire Extinguishers
- ☐ Safety Shower
- ☐ Evacuation Route
- ☐ Other _____

ACCESS

- ☐ Scaffold (properly inspected)
- ☐ Ladder (Tied off)
- ☐ Man lift
- ☐ Personnel Basket (inspected/approved)
- ☐ Operator Training
- ☐ Special Provisions
- ☐ Other _____

WELDING

- ☐ Flash burns
- ☐ Combustibles
- ☐ Spark Containment
- ☐ Shields
- ☐ Grounding
- ☐ Water Hose
- ☐ Fire Extinguisher
- ☐ Fire Blanket
- ☐ Fire Watch
- ☐ Sewer Covers
- ☐ Other _____

OVERHEAD WORK

- ☐ Barricades
- ☐ Signs
- ☐ Hole Cover
- ☐ Handrail
- ☐ Other _____

ELECTRICAL

- ☐ Locked & Tagged out
- ☐ Try Start/Stop Switch
- ☐ GFCI Test
- ☐ Assured Grounding
- ☐ Extension Cord Inspection
- ☐ Other _____

LIFTING

- ☐ Forklift
- ☐ Cherry Picker
- ☐ Load Chart
- ☐ Angle
- ☐ Crane
- ☐ Chain fall
- ☐ Proper Rigging Practices
- ☐ Manual Lifting
- ☐ Condition of Equipment
- ☐ Operator Certificate

HAZARDS (ENVIRONMENTAL)

- ☐ Electrical Shock
- ☐ Heat Stress
- ☐ Heavy Objects
- ☐ Hot/Cold Surf. Or Mat.
- ☐ Inadequate Lighting
- ☐ Line Breaking
- ☐ Noise
- ☐ Poor Access/Egress
- ☐ Sharp Objects
- ☐ Other _____

HAZARDS/CHEMICALS

- ☐ Chemical Burn Shin/Eyes
- ☐ Flammable
- ☐ Ingestion
- ☐ Inhalation
- ☐ Skin Contamination

HAZARDS/BODY

- ☐ Fall Potential
- ☐ Pinch Points
- ☐ Slip-Trip Potential
- ☐ Other _____

OTHER WORK IN AREA

- ☐ Others Working Overhead
- ☐ Type Work Others Doing
- ☐ PPE Due to Other Work
- ☐ Other _____

CONFINED SPACE

Know the following:

Possible hazards within the confined space
First signs of exposure
How to summons help
How to track personnel
Entering and exiting the confined space
Maintain contact with all entrants by voice or visual
Do not attempt to rescue unless you
are a part of a coordinated effort
Remain at entry point assume no duties with take you
from there

SUPERVISOR/FOREMAN RECOMMENDATION:

Applicable Standard Operating Procedures

Appendix D

Refer to documents

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Applicable OSHA Standards: 29 CFR 1910.134

1. Purpose

- 1.2. The purpose of this policy is to comply with the OSHA standards on Respiratory Protection.

2. Scope

- 2.2. This program applies to all Columbia Environmental Services, Inc. controlled work locations where an employee or a subcontract employee may be occupationally exposed to respiratory hazards.

3. Responsibilities

- 3.1. **MANAGEMENT** - It is management's responsibility to determine what specific applications require use of respiratory equipment. Management must also provide proper respiratory equipment to meet the needs of each specific application. Employees must be provided with adequate training and instructions on all equipment.
- 3.2. **MANAGEMENT/SUPERVISORY** - Superintendents, supervisors, foremen, or group leaders of each area are responsible for insuring that all personnel under their control are knowledgeable of the respiratory protection requirements for the areas in which they work. They are also responsible for insuring that their subordinates comply with all facets of this respiratory program, including respirator inspection and maintenance.
- 3.3. **EMPLOYEES** - It is the responsibility of the employee to have an awareness of the respiratory protection requirements for their work areas (as explained by management), according to proper instruction, and for maintaining equipment in a clean and operable condition.

4. Requirements & Guidelines

- 4.1. The Company Safety Coordinator is designated as the program administrator and will be qualified by appropriate training or experience that is commensurate with the complexity of the program to administer or oversee the respiratory protection program and conduct the required evaluations of program effectiveness.
- 4.2. In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary objective of this program will be to prevent atmospheric contamination.
- 4.3. This will be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general and local ventilation, and substitution of less toxic materials).

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- 4.4. Respirators, medical evaluation, fit testing and training will be provided by the Company at no cost to employees when such equipment is necessary to protect the health of the employee. The Company will provide the respirators which are applicable and suitable for the purpose intended. The Safety Coordinator will be responsible for the establishment and maintenance of a respiratory protection program.
- 4.5. The guidelines in this program are designed to help reduce employee exposures against occupational dusts, fumes, mists, radionuclide, gases and vapors.
- 4.6. The primary objective is to prevent atmospheric exposure to these contaminants.
- 4.7. Where feasible, exposure to contaminants will be eliminated by engineering controls (for example, general and local ventilation, enclosure or isolation, and substitution of a less hazardous process or material).
- 4.8. When effective engineering controls are not feasible, use of personal respiratory protective equipment may be required to achieve this goal and will include the following components, as applicable:
 - 4.9.1. Selection of respirators
 - 4.9.2. Medical evaluation
 - 4.9.3. Fit testing
 - 4.9.4. Types of respiratory equipment and their use
 - 4.9.5. Maintenance and care of respirators
 - 4.9.6. Breathing air quality and use
 - 4.9.7. Identification of filters, cartridges, and canisters
 - 4.9.8. Employee training and information
 - 4.9.9. Program evaluation
- 4.10. In any workplace where respirators are necessary to protect the health of the employee or whenever respirators are required, the Company will establish and implement a written respiratory protection program with worksite-specific procedures. The program will be updated as necessary to reflect those changes in workplace conditions that affect respirator use. The employer will include in the program the following provisions of this section, as applicable:
 - 4.10.1. Procedures for selecting respirators for use in the workplace;
 - 4.10.2. Medical evaluations of employees required to use respirators;

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- 4.10.3. Fit testing procedures for tight-fitting respirators;
- 4.10.4. Procedures for proper use of respirators in routine and reasonably foreseeable emergency situations;
- 4.10.5. Procedures and schedules for cleaning, disinfecting, storing, inspecting, repairing, discarding, and otherwise maintaining respirators;
- 4.10.6. Procedures to ensure adequate air quality, quantity, and flow of breathing air for atmosphere-supplying respirators;
- 4.10.7. Training of employees in the respiratory hazards to which they are potentially exposed during routine and emergency situations;
- 4.10.8. Training of employees in the proper use of respirators, including putting on and removing them, any limitations on their use, and their maintenance; and
- 4.10.9. Procedures for regularly evaluating the effectiveness of the program.
- 4.11. The Company will select and provide an appropriate respirator based on the respiratory hazard(s) to which the worker is exposed and workplace and user factors that affect respirator performance and reliability.
- 4.12. The Company will select a NIOSH-certified respirator. The respirator will be used in compliance with the conditions of its certification.
- 4.13. The Company will identify and evaluate the respiratory hazard(s) in the workplace. This evaluation will include a reasonable estimate of employee exposures to respiratory hazard(s) and an identification of the contaminant's chemical state and physical form. Where the Company cannot identify or reasonably estimate the employee exposure, the employer will consider the atmosphere to be IDLH.
- 4.14. The Company will select respirators from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.
- 4.15. The employer will provide the following respirators for employee use in IDLH atmospheres:
 - 4.15.1. A full facepiece pressure demand SCBA certified by NIOSH for a minimum service life of thirty minutes, or
 - 4.15.2. A combination full facepiece pressure demand supplied-air respirator (SAR) with auxiliary self-contained air supply.
 - 4.15.3. Respirators provided only for escape from IDLH atmospheres will be NIOSH-certified for escape from the atmosphere in which they will be used.

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- 4.16. All oxygen-deficient atmospheres will be considered IDLH, except if the Company can demonstrate that, under all foreseeable conditions, the oxygen concentration can be maintained within the ranges specified in the table at right (for the altitudes set out in the table at right), then any atmosphere-supplying respirator may be used.

- 4.17. The Company will provide a respirator that is adequate to protect the health of the employee and ensure compliance with all other OSHA statutory and regulatory requirements, under routine and reasonably foreseeable emergency situations.

- 4.18. The Company will not permit respirators with tight-fitting face pieces to be worn by employees who have:

- 4.18.1. Facial hair that comes between the sealing surface of the facepiece and the face or that interferes with valve function; or

- 4.18.2. Any condition that interferes with the face-to-facepiece seal or valve function.

- 4.19. If an employee wears corrective glasses or goggles or other personal protective equipment, the Company will ensure that such equipment is worn in a manner that does not interfere with the seal of the facepiece to the face of the user.

- 4.20. For all tight-fitting respirators, the Company will ensure that employees perform a user seal check each time they put on the respirator using safety procedures in 29 CFR 1910.146 Appendix B-1 or procedures recommended by the respirator manufacturer that the employer demonstrates are as effective as those in Appendix B-1.

- 4.21. Appropriate surveillance will be maintained of work area conditions and degree of employee exposure or stress.

- 4.22. When there is a change in work area conditions or degree of employee exposure or stress that may affect respirator effectiveness, the Company will reevaluate the continued effectiveness of the respirator.

- 4.23. The Company will ensure that employees leave the respirator use area:

- 4.23.1. To wash their faces and respirator face pieces as necessary to prevent eye or skin irritation associated with respirator use; or

- 4.23.2. If they detect vapor or gas breakthrough, changes in breathing resistance, or leakage of the face piece; or

- 4.23.3. To replace the respirator or the filter, cartridge, or canister elements.

TABLE II	
Altitude (ft.)	Oxygen deficient Atmospheres (% O ₂) for which the employer may rely on atmosphere-supplying respirators
Less than 3,001	15.0-19.5
3,001-4,000	16.4-19.5
4,001-5,000	17.1-19.5
5,001-6,000	17.8-19.5
6,001-7,000	18.5-19.5
7,001-8,000 ¹	19.3-19.5
¹ Above 8,000 feet the exception does not apply. Oxygen-enriched breathing air must be supplied above 14,000 feet.	

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- 4.24. If the employee detects vapor or gas breakthrough, changes in breathing resistance, or leakage of the face piece, the Company must replace or repair the respirator before allowing the employee to return to the work area.
- 4.25. For all IDLH atmospheres, the Company will ensure that:
 - 4.25.1. One employee or, when needed, more than one employee is located outside the IDLH atmosphere;
 - 4.25.2. Visual, voice, or signal line communication is maintained between the employee(s) in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere;
 - 4.25.3. The employee(s) located outside the IDLH atmosphere are trained and equipped to provide effective emergency rescue;
 - 4.25.4. The Company representative or designated supervisor is notified before the employee(s) located outside the IDLH atmosphere enter the IDLH atmosphere to provide emergency rescue; and
 - 4.25.5. The representative or designated supervisor authorized to do so by the Company, once notified, provides necessary assistance appropriate to the situation.
- 4.26. Employee(s) located outside IDLH atmospheres are equipped with:
 - 4.26.1. Pressure demand or other positive pressure SCBAs, or a pressure demand or other positive pressure supplied-air respirator with auxiliary SCBA; and either
 - 4.26.2. Appropriate retrieval equipment for removing the employee(s) who enter(s) these hazardous atmospheres where retrieval equipment would contribute to the rescue of the employee(s) and would not increase the overall risk resulting from entry; or
 - 4.26.3. Equivalent means for rescue where retrieval equipment is not required.
- 4.27. Appropriate surveillance will be maintained of work area conditions and degree of employee exposure or stress. When there is a change in work area conditions or degree of employee exposure or stress that may affect respirator effectiveness, the Company will reevaluate the continued effectiveness of the respirator.
- 5. **Maintenance & Care of Respirators**
 - 5.1. The Company will provide for the cleaning and disinfecting, storage, inspection, and repair of respirators used by employees.

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- 5.2. The Company will provide each respirator user with a respirator that is clean, sanitary, and in good working order. The Company will ensure that respirators are cleaned and disinfected using procedures required by OSHA, or procedures recommended by the respirator manufacturer, provided that such procedures are of equivalent effectiveness.
- 5.3. The respirators will be cleaned and disinfected at the following intervals:
 - 5.3.1. Respirators issued for the exclusive use of an employee will be cleaned and disinfected as often as necessary to be maintained in a sanitary condition;
 - 5.3.2. Respirators issued to more than one employee will be cleaned and disinfected before being worn by different individuals;
 - 5.3.3. Respirators maintained for emergency use will be cleaned and disinfected after each use; and
 - 5.3.4. Respirators used in fit testing and training will be cleaned and disinfected after each use.
- 5.4. The Company will ensure that all respirators will be stored to protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals, and they will be packed or stored to prevent deformation of the face piece and exhalation valve.
- 5.5. Additionally, emergency respirators will be:
 - 5.5.1. Kept accessible to the work area;
 - 5.5.2. Stored in compartments or in covers that are clearly marked as containing emergency respirators; and
 - 5.5.3. Stored in accordance with any applicable manufacturer instructions.
- 5.6. The Company will ensure that respirators are inspected as follows:
 - 5.6.1. All respirators used in routine situations will be inspected before each use and during cleaning;
 - 5.6.2. All respirators maintained for use in emergency situations will be inspected at least monthly and in accordance with the manufacturer's recommendations, and will be checked for proper function before and after each use; and
 - 5.6.3. Emergency escape-only respirators will be inspected before being carried into the workplace for use.

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5.7. The Company will ensure that respirator inspections include the following:

5.7.1. A check of respirator function, tightness of connections, and the condition of the various parts including, but not limited to, the facepiece, head straps, valves, connecting tube, and cartridges, canisters or filters; and

5.7.2. A check of elastomeric parts for pliability and signs of deterioration.

5.8. In addition to other requirements of this program, self-contained breathing apparatus will be inspected monthly. Grade D air cylinders will be maintained in a fully charged state and will be recharged when the pressure falls to 90% of the manufacturer's recommended pressure level. The Company will determine that the regulator and warning devices function properly.

5.9. For respirators maintained for emergency use, the Company will:

5.9.1. Certify the respirator by documenting the date the inspection was performed, the name (or signature) of the person who made the inspection, the findings, required remedial action, and a serial number or other means of identifying the inspected respirator; and

5.9.2. Provide this information on a tag or label that is attached to the storage compartment for the respirator, is kept with the respirator, or is included in inspection reports stored as paper or electronic files. This information will be maintained until replaced following a subsequent certification.

6. Selection Of Respirators

6.1. Respirators are selected and approved by management. The selection is based upon the physical and chemical properties of the air contaminants and the concentration level likely to be encountered by the employee.

6.2. The respirator program administrator will make a respirator available immediately to each employee who is placed as a new hire or as a transferee in a job that requires respiratory protection. Replacement respirators/pre-filters will be made available as required. The Respirator Program Administrator for Columbia Environmental Services, Inc. is the Company Safety Director.

6.3. Standard respirators currently approved by this Company are:

6.3.1. 3M "EASI-AIR" 7200S -- Dual Cartridge Respirator

6.3.2. 3M 8210 -- N95 Particulate Respirator

6.3.3. MSA "COMFO II ELITE" 7-201 -- Dual Cartridge Respirator

6.3.4. Gerson 1730 -- N95 Particulate Respirator

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- 6.4. More than one hazard may exist for a given operation and more than one respirator could be used to protect against a number of different air contaminants. Correct respirator selection for each situation however, is a complex job.
- 6.5. Before proper respiratory protection can be assigned, we must consider the nature of the hazard, extent and limitations of respirators. It is important to select the right equipment for the job.
- 6.6. Evaluation of exposure to a toxic air-borne material necessitates:
 - 6.6.1. Identifying the type of contaminant (mist, dust, vapor, gas, and fume).
 - 6.6.2. Logging the name of the contaminant.
 - 6.6.3. Listing pertinent physical and chemical properties (LEL, Flash Point, etc.)
 - 6.6.4. Estimating or monitoring the concentration of the contaminant in the breathing zone and immediate work area.
 - 6.6.5. Noticing the Threshold Limit Value (TLV) -- both OSHA and ACGIH recommended levels.
 - 6.6.6. Comparing the surveyed levels to the recommended exposure limits. (Ceiling, short term, time-weighted average).
 - 6.6.7. Noting odor threshold, IDLH level, warning properties and if contaminant is an eye irritant.
 - 6.6.8. Evaluating whether the contaminant can be trapped by a given sorbent efficiently; or would react with filter media.
 - 6.6.9. Recording if the contaminant may cause systemic poisoning by absorption through the skin.
- 6.7. The toxicology of a given contaminant can be assessed when all information outlined above is evaluated on a respirator selection work sheet.
- 6.8. The overall protection afforded by a given respirator design (and mode of operation) may be defined in terms of its assigned protection factor (APF). The APF is a measure of the degree of protection afforded by a respirator, defined as the ratio of the concentration of contaminant in the ambient atmosphere to that inside the enclosure (usually inside the face piece) under conditions of use.
- 6.9. Respirators should be selected so that the concentration inhaled and the APFs are selection and use guides. These guides should only be used when the employer has established a minimal acceptable respirator program as defined in Section 3 of the ANSI Z88.2-1969 Standard.

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- 6.10. In addition to face pieces, this includes any type of enclosure or covering of the wearer's breathing zone, such as supplied-air hoods, helmets or suits.
- 6.11. Review should include dusts, mists, and fumes only. Consideration does not apply when gases or vapors are absorbed on particulates and may be volatilized or for particulates volatile at room temperature. Example: coke oven emissions.
- 6.12. Review also should be given to any single-use dust respirator (with or without valve) not specifically tested against a specified contaminant.
- 6.13. Dust filter refers to a dust respirator and includes all types of media -- that is, both non-degradable mechanical type media and degradable resin-impregnated wool felt or combination wool-synthetic felt media.
- 6.14. Fume filter refers to a fume respirator approved by the lead fume test. All types of media are included.
- 6.15. High-efficiency filter refers to a high-efficiency particulate respirator filter with at least 99.9% efficiency against 0.3 microns in accordance with NIOSH specifications.
- 6.16. For gases and vapors, an APF should only be assigned when published test data indicate the cartridge or canister has adequate sorbent efficiency and service life for a specific gas or vapor. In addition, the APF should not be applied in gas or vapor concentrations that are: (1) immediately dangerous to life, (2) above the lower explosive limit, and (3) cause eye irritation when using a half mask.
- 6.17. A positive pressure supplied-air respirator equipped with a half-mask face piece may not be as stable on the face as a full face piece. Therefore, the APF recommended is half that for a similar device equipped with a full face piece.
- 6.18. A positive pressure supplied-air respirator equipped with a full face piece provides eye protection but is not approved for use in an atmosphere that is immediately dangerous to life.
- 6.19. The design of the supplied-air hood, suit, or helmet (with a minimum of 170 liters/min. of air) may determine its overall efficiency and protection. For example, when working with the arms over the head, some hoods draw the contaminant into the hood-breathing zone. This may be overcome by wearing a short hood under a coat or overalls. Other limitations specified by the approval agency must be considered before using in certain types of atmospheres.
- 6.20. The SCBA operated in the positive pressure mode has been tested and the face piece recorded as < 0.01% penetration. Therefore, a PF of 1,000 + is recommended. At this time, the lower limit of detection 0.01% does not warrant listing a higher number. A positive pressure SCBA for an unknown concentration is recommended. This is consistent with the 1,000 + that is listed. It is essential to have an emergency device for use in unknown concentrations. A combination supplied-air respirator in pressure-demand or other positive pressure mode, with

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auxiliary self-contained air supply, is also recommended for use in unknown concentrations of contaminants immediately dangerous to life. Other limitations, such as skin absorption of HCN or tritium, must be considered.

- 6.21. The protection a respirator may provide for a worker is dependent upon his type of unit and the fit. A respirator protection factor is an indicator of how much protection a respirator may provide. The factor is the ratio of the contaminant concentrations outside vs. inside the respirator, $P = C/C_i$. This is determined by quantitative testing. The general rule of thumb, however, says the protection factor is the approximate average effectiveness of a given respirator in qualitative tests with good face seal. Under normal operating conditions, the time-weighted average (TWA) concentration x protection factor = maximum concentration of a contaminant against which a particular type of respirator may be used.
- 6.22. For example: If an employee were spray painting with an enamel paint cut with toluol solvent and the measured TWA concentration was 200 ppm, and the TLV (ACGIH) is 100 ppm, then a half mask air purifying respirator with organic vapor trapping cartridges is satisfactory.

7. Work Area Monitoring

- 7.1. To ensure the adequacy of a respiratory protection program, monitoring will be conducted on exposure hazards as a basis to provide for a continuing healthful environment for employees. Personal sampling equipment may be used in accordance with accepted industrial hygiene standards to sample each work area. Results of these samples will pinpoint areas where respiratory protection is required. A "Job Description -- Respirator Specification" Form will also document what type of equipment should be worn for specific hazards present.

8. Cartridge Change Schedule

- 8.1. Using the present available air monitoring data, cartridges will be changed as follows:
 - 8.1.1. Organic vapor cartridges -- 1 time per week or when need for change is otherwise indicated

9. Medical Evaluation

- 9.1. Using a respirator may place a physiological burden on employees that varies with the type of respirator worn, the job and workplace conditions in which the respirator is used, and the medical status of the employee. Accordingly, this program specifies the minimum requirements for medical evaluation that the Company will implement to determine the employee's ability to use a respirator.
- 9.2. The Company will provide a medical evaluation to determine the employee's ability to use a respirator, before the employee is fit tested or required to use the respirator

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in the workplace. The employer may discontinue an employee's medical evaluations when the employee is no longer required to use a respirator.

- 9.3. The Company will identify a physician or other licensed health care professional (PLHCP) to perform medical evaluations using a medical questionnaire or an initial medical examination that obtains the same information as the medical questionnaire.
- 9.4. The medical evaluation will obtain the information requested by the questionnaire required in this program.
- 9.5. The Company will ensure that a follow-up medical examination is provided for an employee who gives a positive response to any question among questions 1 through 8 in Section 2 of the questionnaire, whose initial medical examination demonstrates the need for a follow-up medical examination.
- 9.6. The follow-up medical examination will include any medical tests, consultations, or diagnostic procedures that the PLHCP deems necessary to make a final determination.
- 9.7. The medical questionnaire and examinations will be administered confidentially during the employee's normal working hours or at a time and place convenient to the employee. The medical questionnaire will be administered in a manner that ensures that the employee understands its content.
- 9.8. The Company will provide the employee with an opportunity to discuss the questionnaire and examination results with the PLHCP.
- 9.9. Each employee required to wear a respirator will fill out a Medical Evaluation Questionnaire.
- 9.10. The Medical Evaluation Questionnaire will be read by a PLHCP. If the PLHCP determines a follow-up examination is necessary, the employee will make themselves available, during regular business hours, for the follow-up examination. Once the PLHCP has performed all the required duties a written recommendation will be rendered by the PLHCP for the type of respirator which can be worn.

10. Limitations and Surveillance

- 10.1. Employees should be physically fit and able to perform job duties while wearing a respirator. If a physician determines that a worker has a severe cardiovascular or pulmonary dysfunction that would be aggravated by wearing a respirator; then by a written PLHCP opinion, that person would be exempted from a job requiring the use of a respirator.
- 10.2. Conditions that may prevent a person from using an atmosphere supplying respirator may include:
 - 10.2.1. Emphysema

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- 10.2.2. Chronic pulmonary obstructive disease
- 10.2.3. X-ray evidence of pneumoconiosis
- 10.2.4. Coronary artery disease
- 10.2.5. Heart attack
- 10.2.6. Bronchial asthma
- 10.2.7. High blood pressure
- 10.2.8. Epilepsy
- 10.2.9. Diabetes
- 10.2.10. Restrictive heart abnormalities
- 10.2.11. Experiencing anxiety or any problems when wearing a respirator
- 10.2.12. Open hole in the eardrum
- 10.3. Persons should not be assigned to tasks requiring the use of respirators unless it has been determined that they are physically able to perform the work and use the equipment. A "yes" answer to any of the preceding questions would constitute a warning sign regarding the use of respirators. A medical opinion to confirm any of the above situations (answered "yes") should then be obtained. The respirator user's medical status should be reviewed periodically (for instance, annually).
- 10.4. No beards or facial hair should interfere with the sealing surfaces of any respirator. If respiratory protective equipment is required for a job, no beards or long sideburns will be allowed, as they will not permit a good face seal.
- 10.5. Contact lenses cannot be worn in an atmosphere that necessitates the use of respirators. No glasses may be worn with a full face piece respirator, unless the face piece is fitted with an adapter.
- 10.6. Should a worker have exposure to certain toxic materials, periodic medical examinations such as urinalysis, blood chemistries, or bioassay may be required even though the employee wears the proper respiratory protective equipment.

11. Fit Testing

- 11.1. Before an employee may be required to use any respirator with a negative or positive pressure tight-fitting facepiece, the employee must be fit tested with the same make, model, style, and size of respirator that will be used. This section specifies the kinds of fit tests allowed, the procedures for conducting them, and how the results of the fit tests must be used.

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- 11.2. The Company will ensure that employees using a tight-fitting facepiece respirator pass an appropriate qualitative fit test (QLFT) or quantitative fit test (QNFT) as stated in this paragraph.
- 11.3. The Company will ensure that an employee using a tight-fitting facepiece respirator is fit tested prior to initial use of the respirator, whenever a different respirator facepiece (size, style, model or make) is used, and at least annually thereafter.
- 11.4. The Company will conduct an additional fit test whenever the employee reports, or the employer, PLHCP, supervisor, or program administrator makes visual observations of, changes in the employee's physical condition that could affect respirator fit. Such conditions include, but are not limited to, facial scarring, dental changes, cosmetic surgery, or an obvious change in body weight.
- 11.5. If after passing a QLFT or QNFT, the employee subsequently notifies the Company, program administrator, supervisor, or PLHCP that the fit of the respirator is unacceptable, the employee will be given a reasonable opportunity to select a different respirator facepiece and to be retested.
- 11.6. The fit test will be administered using an OSHA-accepted QLFT or QNFT protocol.
- 11.7. QLFT may only be used to fit test negative pressure air-purifying respirators that must achieve a fit factor of 100 or less.
- 11.8. If the fit factor, as determined through an OSHA-accepted QNFT protocol, is equal to or greater than 100 for tight-fitting half facepieces, or equal to or greater than 500 for tight-fitting full facepieces, the QNFT has been passed with that respirator.
- 11.9. Fit testing of tight-fitting atmosphere-supplying respirators and tight-fitting powered air-purifying respirators will be accomplished by performing quantitative or qualitative fit testing in the negative pressure mode, regardless of the mode of operation (negative or positive pressure) that is used for respiratory protection.
- 11.10. Qualitative fit testing of these respirators will be accomplished by temporarily converting the respirator user's actual facepiece into a negative pressure respirator with appropriate filters, or by using an identical negative pressure air-purifying respirator facepiece with the same sealing surfaces as a surrogate for the atmosphere-supplying or powered air-purifying respirator facepiece.
- 11.11. Quantitative fit testing of these respirators will be accomplished by modifying the facepiece to allow sampling inside the facepiece in the breathing zone of the user, midway between the nose and mouth. This requirement will be accomplished by installing a permanent sampling probe onto a surrogate facepiece, or by using a sampling adapter designed to temporarily provide a means of sampling air from inside the facepiece.

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- 11.12. Any modifications to the respirator facepiece for fit testing will be completely removed, and the facepiece restored to NIOSH-approved configuration, before that facepiece can be used in the workplace.

12. Implementation

- 12.1. Employees required to wear a respirator must be fitted properly and tested for a face seal prior to use of the respirator in a contaminated area. Manufacturers provide fitting instructions and use limitations on the product packaging.
- 12.2. Qualitative fit testing is acceptable for most hazards in the work place. (Refer to OSHA standards for specific direction.)
- 12.3. Fitting - For a respirator to work effectively, it must fit well and feel comfortable. All the care that went into proper respirator selection will not protect the worker if the face piece does not fit properly. Fitting is most critical for self-contained breathing apparatus and respirators used in IDLH atmospheres.
- 12.4. There are two categories of fitting tests -- qualitative and quantitative.
- 12.4.1. Qualitative tests include:
- 12.4.1.1. Negative Pressure Test - Close off air inlet of canister, cartridge, or filter with palms, inhale gently so that the face piece collapses. Hold breath for 10 seconds, if the face piece remains slightly collapsed and no inward leakage is detected, the respirator probably has an adequate fit.
 - 12.4.1.2. Positive Pressure Test - Close off exhalation valve, exhale gently into the face piece. If a positive pressure can be built up inside the face piece without excess outward leakage, the fit is good. Take care not to disturb placement of the face piece by placing undue pressure on the mask with hand.
 - 12.4.1.3. Banana Oil Testing - A worker is subjected to isoamyl acetate vapor (banana oil) adjacent to sealing surfaces of the respirator face piece. If there is a detectable odor inside the mask, then the face piece should be refitted in clean air; and the test repeated, switching respirators if necessary, until a fit is made.
 - 12.4.1.4. Irritant Smoke Test - Stannic chloride is impregnated on pumice in glass tubes. When the tube ends are broken, irritant smoke is released. The tester puffs smoke towards the wearer from increasingly shorter distances until the tube is within about 6 inches of the respirator, where the smoke is then directed toward potential sources of leakage. At this point, if no leakage has been detected, the wearer may cautiously begin

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various head movements to simulate use in particular job. This test has an advantage in that the wearer usually reacts involuntarily to leakage by coughing or sneezing. If there is a reaction, stop producing smoke immediately. The irritant smoke test is valid for testing both air-purifying and atmosphere-supplying respirators; but an air-purifying respirator must have high efficiency filters.

12.4.2. Quantitative test uses instruments to measure (quantify) the amount of test chemical outside vs. inside of the respirator. This type of test expresses the amount of leakage as a percentage of the challenge atmosphere outside of the mask. This test is excellent when face piece leakage must be minimized for work in IDLH atmospheres. A quantitative test may be required when employees are exposed to chemical agents like acrylonitrile, benzene, coal tar pitch volatiles or vinyl chloride.

12.5. When fitting any face piece the head straps must be comfortable. Tightening the straps will sometimes reduce leakage, but the wearer may be unable to tolerate the respirator for any length of time; thus invalidating the fitting test for a normal job routine.

13. Types of Respiratory Protective Equipment and Their Uses

13.1. There are three categories of respirators: air purifying, atmosphere supplying and combination respirators.

13.1.1. Air purifying

13.1.1.1. Single Use Disposal Dust Mask or Filter -- This mask protects against dusts and mists having a TLV not less than .05 mg/m³ or 2.0 mppcf. The respirator has a disposal filter and elastic straps for comfort and tight fit.

13.1.1.2. Half Mask Respirator for Dust, Mist Fumes -- The respirator covers the mouth and nose and is provided with flexible straps and is either totally disposal or has replaceable cartridges. Not for use in concentrations greater than 10 x TLV.

13.1.1.3. Half Mask Respirator for Gases and Vapors -- The half mask chemical cartridge respirator has a rubber facepiece flexible straps, exhalation port and element holders. Screw in cartridges are available for protection against most gases and vapors.

13.1.1.4. Emergency Escape Respirator -- This mouthpiece-type respirator offers protection against low concentrations of gases or vapors or may be used for escape from hazardous

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atmosphere if the chemical cartridge will absorb the contaminant.

13.1.2. Atmosphere supplying

- 13.1.2.1. Escape Air Supplied Respirator -- This device is used for escape only from hazardous atmospheres. The respirator's plastic hood is for fresh air from a pack placed behind the neck.
- 13.1.2.2. Airline Respirator -- Air under pressure is fed to either a larger more flexible hose or regulator where the pressure reduced and the breathing air delivered to a flexible face piece. Types: demand and continuous flow pressure demand.
- 13.1.2.3. Airline Respirator with Self-contained Escape Cylinder -- This unit is similar to the airline respirator and includes a small compressed air bottle with regulator to provide breathable air for work in, and escape from, IDLH atmosphere.\
- 13.1.2.4. Self-Contained Breathing Apparatus (SCBA) -- Demand and pressure demand SCBA units are used in operations for hazardous work or rescue. The SCBA equipment includes a compressed air cylinder, regulator, flexible hose to a full face piece, and shoulder harness.
- 13.1.2.5. Abrasive Blasting Hood -- A helmet and protection apron fed by air from a compressor or cascade of cylinders that is used for protection in sandblasting and may be fitted with a vortex tube to assist in cooling worker.

13.1.3. Airline respirator with escape bottle -- The airline respirator with full face piece in the pressure- demand mode is designed for use in atmospheres immediately dangerous to life or health when used with an approved emergency escape system. With the potential hazards involved when using this respirator, it is imperative that this type of equipment be inspected before and after each use.

13.1.3.1. Before entry into a hazardous area, check the following:

- 13.1.3.1.1. Hose length to the escape unit from a compressor or bottle cascade system should be adequate to perform all types of work, but not greater than 300 feet.
- 13.1.3.1.2. All connections should be tight and free of leaks. Rubber hose from the face piece to the regulator and hand disconnect union should be hand tight only.

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- 13.1.3.1.3. The face piece and all hoses should be free of cracks and the regulators functioning normally at recommended pressures.
- 13.1.3.1.4. The air pressure in the emergency escape bottle should be approximately 2100 pounds per square inch (PSI).
- 13.1.3.1.5. Face seal on respirator should be good by using negative pressure test.
- 13.1.3.1.6. Make sure the respirator works properly before entering a contaminated area.
- 13.1.3.2. When using an airline respirator with an emergency escape bottle:
 - 13.1.3.2.1. Never over-pressure the regulator.
 - 13.1.3.2.2. The bottle should be used for escape from a hazardous atmosphere. Do not breathe from the bottle during normal work. Do not turn on the air supply from the bottle except to escape from a hazardous area, if the main air supply has been cut off.
 - 13.1.3.2.3. After the escape cylinder has been used or the air pressure is below the recommended level (2100 PSI), the foreman at the job site should be notified and the foreman should then see that this equipment is refilled with certified breathing air.
 - 13.1.3.2.4. Exposure to high levels of contaminants requires that all exposed skin be properly protected.
- 13.1.4. Self contained breathing apparatus -- Self contained breathing apparatus (SCBA) should be used for emergencies like clean-up of a large spill, fire fighting, or rescue from a hazardous area. The equipment must be checked before and after each use and at least monthly. Routine inspection of this equipment assures that it will be ready for use in an emergency.
 - 13.1.4.1. Thirty (30) minute SCBA units provide protection against most airborne agents and are an excellent back-up system when tank cleaning, vessel entry or breaking into lines is done with airline-SCBA equipment.
 - 13.1.4.2. Before Using Any SCBA Equipment:

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- 13.1.4.2.1. Inspect the connections for tight fit and possible leaks.
- 13.1.4.2.2. Inspect all parts of the respirator for damage or excessive wear. Check low air pressure alarm.
- 13.1.4.2.3. Check the air pressure in the cylinder, it should read approximately 2100 PSI, and check the air flow to the face piece.
- 13.1.4.2.4. Make sure you can get a good face seal. Use the negative pressure fitting test to check the fit. Do not wear this apparatus if you have a beard, long side burns or wear glasses.
- 13.1.4.2.5. Be sure you have been properly instructed before using this equipment.

13.1.4.3. When Using SCBA Equipment:

- 13.1.4.3.1. Do not attach the hose from the respirator face piece until you are ready to enter the contaminated area. This will conserve the air supply in the cylinder.
- 13.1.4.3.2. If the alarm bell rings, signaling a lowered air supply, LEAVE THIS CONTAMINATED AREA AT ONCE!
- 13.1.4.3.3. If air flow is insufficient for any reason, turn on the bypass valve to increase air flow to the face piece and leave the area immediately. Do not return to the hazardous area until the equipment is repaired or a new SCBA unit is issued.

13.1.4.4. After Using SCBA Equipment:

- 13.1.4.4.1. Close all valves and then de-pressure the hose through the by-pass valve.
- 13.1.4.4.2. Tell the foreman that the cylinder has been discharged. The foreman should then see that the cylinder is properly charged with certified breathing air.
- 13.1.4.4.3. This equipment should be inspected, tagged and properly stored to protect against damage and to insure ready use.

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14. Emergencies And Special Operations

- 14.1. Self-contained breathing apparatus may be required in specific areas for emergency use. This equipment will be used only by trained personnel when it is necessary to enter hazardous atmospheres. The following points should be considered:
 - 14.1.1. All potential users will be fully trained in the use of this equipment.
 - 14.1.2. When the equipment is used, it will be tested in an uncontaminated atmosphere prior to entering the hazardous area if possible.
 - 14.1.3. An employee will not work with this apparatus in a hazardous atmosphere on an individual basis. At least one additional employee suitably equipped with a similar breathing apparatus must be in contact with the first employee and must be available to render assistance if necessary.
 - 14.1.4. This equipment will be inspected monthly by trained department or group personnel.
- 14.2. There are certain situations where only one type of respiratory protection should be considered. For fire fighting and rescue from a hazardous atmosphere only self-contained breathing apparatus is acceptable. In confined spaces with IDLH atmospheres only SCBA, airline with escape bottle or other approved equipment should be used.
- 14.3. Emergencies, such as explosion and fire, release of high concentrations of toxic gas or vapor, and rescue will be discussed at those locations where incidents occur.
- 14.4. Special operations like tank cleaning, tower maintenance, turnarounds, clean up of large spills, etc., and the use of appropriate respirators, will be covered by safety personnel, superintendents or foremen.
- 14.5. Before entering areas that could be oxygen deficient or have chemical contaminants of unknown concentration, the work environment should be monitored with available equipment to determine exposure levels. If the proper equipment is not on hand or special monitoring is required, contact the Site Supervisor or the Company Safety Coordinator; if unavailable and on a client's work location, contact the client's safety personnel.

15. Additional Respirator Information

- 15.1. Canister Gas Masks
 - 15.1.1. Some operations require the use of canister masks to protect against chemical contaminants. This equipment is designed to filter harmful chemical agents from the air; however, this is not multi-purpose equipment and will not afford protection for all exposures.

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15.1.2. Each gas mask canister is made for protection from a certain agent or group of agents with similar properties. The manufacturer's instructions for proper use should be followed carefully.

15.1.3. Gas masks should not be used if any of the following conditions exists:

15.1.3.1. Oxygen content in work area is below 19.5%.

15.1.3.2. If contaminant concentrations are unknown or are likely to be very high.

15.1.3.3. If the atmosphere has been determined to be immediately dangerous to life or health (IDLH).

15.1.3.4. If any chemical agent in the work area has poor odor warning properties or is odorless like carbon monoxide.

15.1.3.5. If the gas mask is not effective in filtering the chemical agent, i.e. H₂S - hydrogen sulfide.

15.1.4. If gas masks are used, then canisters must be used prior to the expiration date.

15.1.5. Wearer must leave the contaminated area if:

15.1.5.1. Any odor is detected within mask, or

15.1.5.2. The canister is noticeably causing an increase in breathing resistance.

15.1.6. Gas mask canisters should be changed after each use.

15.1.7. All instructions for proper use should be followed.

16. Maintenance & Care Of Respirators

16.1. The following points should be considered for respirator inspection and maintenance:

16.1.1. The wearer of a respirator will inspect it daily whenever it is in use.

16.1.2. Supervisor, foreman, or group leader will periodically spot check respirators for fit, usage, and condition.

16.1.3. Respirators not discarded after one shift use will be cleaned on a daily basis, according to the manufacturer's instructions, by the assigned employee or other person designated by the respirator program coordinator.

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- 16.1.4. Respirators not discarded after one shift use, will be stored in a suitable container away from areas of contamination.
- 16.1.5. Whenever feasible, respirators not discarded after one shift use, will be marked or stored in such a manner to assure that they are worn only by the assigned employee. If used by more than one employee is required, the respirator will be cleaned between uses.
- 16.2. Maintenance of respiratory protective equipment is essential to the overall effectiveness of the program. Wearing a poorly maintained or malfunctioning respirator could be more hazardous than not having any respirators available. A worker wearing a defective respirator thinks he is fully protected when, in reality, he may not be.
- 16.3. Emergency equipment must be maintained routinely. Self-contained breathing apparatus is generally used in the most hazardous and demanding circumstances; wearing a defective unit could have lethal results.
- 16.4. Equipment should be repaired by trained personnel or the manufacturer. Only designated replacement parts should be used when assembling respirators. Substitution of parts from a different brand or type of respirator invalidates approval of the device. All respiratory protective equipment should be cleaned and disinfected. For most respirators, hot soap and water and a hot rinse is adequate. Manufactured disinfectant solutions aid in sterilization. Respirators used in atmospheres immediately dangerous to life or health or for emergencies or rescue should be cleaned after each use.
- 16.5. Respirators should be stored to protect against dust, sunlight, heat, extreme cold, high humidity, corrosive conditions and contamination. Respirators should be protected and stored in a sealed plastic bag in a metal cabinet. If equipment is issued to an employee, it is his/her responsibility to keep it clean and store it in the proper manner.
- 16.6. Emergency equipment should be readily available for use, not under lock and key, and strategically placed for ready access in an emergency.
- 16.7. All respirators should be inspected to check for tightness of the connections, fit of component parts and adjustment of straps on the face piece as follows:
 - 16.7.1. Air purifying - when inspecting this type of respirator, be sure to check the head straps for wear and cracks; face piece for broken element holders or split lens, sealing of exhalation valve, and air purifying elements for correct type, expiration date, gasket seal, and previous use. Reusable air purifying respirators should be inspected before and after each use.
 - 16.7.2. Atmosphere supplying - although units differ in construction, examination should include: a check of head straps and face piece, condition of lines or hoses and connections, and inspection of regulators, valve, cylinders and

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warning alarms. Most important- respirators for emergency use should be inspected monthly; and the person initializing the record tag should make certain that the SCBA equipment is in good working order. Atmosphere supplying equipment not used routinely should be inspected after use before it is put back into service.

17. Breathing Air Quality And Use

17.1. This section will assure that breathing air for atmosphere supplied-air respirators is of high quality. When supplied-air is used the following will be required:

17.1.1. Compressed breathing will be Type 1 - Grade D as described in ANSI/Compressed Gas Association Commodity Specification for Air, G-7.1-1989.

17.1.2. Compressors used to supply breathing air will be constructed and situated to prevent entry of contaminated air into the air-supply system, minimize moisture, have suitable in-line air filters, will have a tag on the filter showing last date changed and signature of person changing filter.

17.1.3. Oil lubricated compressors will have a high temperature alarm or CO alarm, or both; if only a high temperature alarm is used the air supply will be monitored at intervals sufficient to prevent CO in the breathing air from exceeding 10 PPM.

17.1.4. Breathing air line couplings will be incompatible with non-respirable worksite air or gas systems. No asphyxiating substances will be introduced into the breathing air system.

17.1.5. Pure oxygen will not be used in breathing air cylinders or systems.

18. Identification of Filters, Cartridges, and Canisters

18.1. All filters, cartridges and canisters used in the workplace will be labeled and color coded with the NIOSH approved label and that label will not be removed and will remain legible.

19. Employee Training and Information

19.1. The Company will provide effective training to employees who are required to use respirators. The training must be comprehensive and understandable. This includes providing basic information on respirators to employees who wear respirators when not required by OSHA or the Company to do so.

19.2. Additionally, employees who use respirators will be retrained annually, and also in the event of any of the following:

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- 19.2.1. There are changes in the workplace or the type of respirator being used that contradict or make obsolete previous training;
 - 19.2.2. Observation or evaluation is made that indicate an employee's knowledge or use of a respirator is not in accordance with program requirements, or the individual has not retained the required training information, knowledge or skills; or
 - 19.2.3. Some other situation arises that indicates the need for retraining to ensure that employees are using respiratory equipment safely and in accordance with program requirements.
- 19.3. Regarding training objectives and requirements, each employee must demonstrate knowledge of at least the following:
- 19.3.1. Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator;
 - 19.3.2. What the limitations and capabilities of the respirator are;
 - 19.3.3. How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions;
 - 19.3.4. How to inspect, put on and remove, use, and check the seals of the respirator;
 - 19.3.5. What the procedures are for maintenance and storage of the respirator;
 - 19.3.6. How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators; and
 - 19.3.7. The general requirements of OSHA and the Company's safety program regarding safe use of respirators.
- 19.4. Each employee, upon assignment to an area requiring respirators, must be instructed by his superintendent, supervisor, foreman, or group leader relative to their responsibilities in the respiratory program. They will be instructed in need, use, limitations, and care of their respirator(s).
- 19.5. There are basic components of training that are common to both workers and supervisors. Each person must have an opportunity to handle the respirator, check different fitting techniques, test face piece-to-face seal, and to wear the respirator in normal air prior to starting a job. In addition there should be a discussion of engineering and administrative controls in use, and why respirators also are needed. The nature of the respiratory hazard and what happens if the respirator is not worn, or used improperly should be explained.

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- 19.6. The employees should be informed why a particular type of respirator has been selected and how to use respirators in emergencies and special operations.
- 19.7. Supervisors who oversee the daily activities of workers who wear respirators should be familiar with the following:
 - 19.7.1. Work requirements and conditions necessitating the use of respirator protective equipment. These may include:
 - 19.7.1.1. Time of exposure to a contaminant
 - 19.7.1.2. The activity and mobility of the worker
 - 19.7.1.3. Eye protection needed
 - 19.7.1.4. Temperature extremes
 - 19.7.1.5. Face piece-to-face seal of various types of equipment
 - 19.7.2. Nature and extent of hazards to which a worker may be exposed.
 - 19.7.2.1. Type of contaminant and its concentration
 - 19.7.2.2. Acute (short term) or chronic (long term) exposure potential
 - 19.7.3. The general operation of the program; maintenance and inspection of equipment, issuance of respirators, and control of their use.
 - 19.7.4. Legal requirements pertinent to the use of respirators in a capacity as supervisor.
- 19.8. A Supervisor can get help and information from the Respirator Training Guide, Material Safety Data Sheets, or the Safety Director.
- 19.9. Since the worker will be directly exposed to contaminants, he/she must know:
 - 19.9.1. The nature of the hazard and what might happen if a selected respirator is not worn.
 - 19.9.2. What control measures are being considered in addition to wearing personal protective equipment?
 - 19.9.3. Why a particular respirator was selected for that job.
 - 19.9.4. The limitations of a specific respirator.
 - 19.9.5. How to use any respirator assigned to him/her and to adjust the unit for a proper fit.

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19.9.6. Maintenance, storage and cleaning of respirators.

19.9.7. How to recognize an emergency and use the proper equipment.

19.10. The supervisor will provide training with help from the Safety Coordinator.

19.11. The most effective respiratory protective equipment is that equipment which is worn. The best way to insure that the respirators will be worn is to handle objections to wearing the equipment. The worker must be motivated to wear the respirator by instilling in him the desire and need to wear the proper equipment. If objections to fit, size, type, etc., are handled, then there will be a greater likelihood that the worker will wear the respirator provided.

20. Program evaluation

20.1. The Company will conduct evaluations of the workplace to ensure that the written respiratory protection program is being properly implemented, and to consult employees to ensure that they are using the respirators properly.

20.2. The Company will conduct evaluations of the workplace as necessary to ensure that the provisions of the current written program are being effectively implemented and that it continues to be effective.

20.3. The Company will regularly consult employees required to use respirators to assess the employees' views on program effectiveness and to identify any problems. Any problems that are identified during this assessment will be corrected. Factors to be assessed include, but are not limited to:

20.3.1. Respirator fit (including the ability to use the respirator without interfering with effective workplace performance);

20.3.2. Appropriate respirator selection for the hazards to which the employee is exposed;

20.3.3. Proper respirator use under the workplace conditions the employee encounters; and

20.3.4. Proper respirator maintenance.

21. Recordkeeping

21.1. The Company will establish and retain written information regarding medical evaluations, fit testing, employee training and the respirator program. This information will facilitate employee involvement in the respirator program, assist the employer in auditing the adequacy of the program, and provide a record for compliance determinations by OSHA.

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- 21.2. Records of medical evaluations required by this section must be retained and made available in accordance with 29 CFR 1910.1020.
- 21.3. The employer will establish a record of the qualitative and quantitative fit tests administered to an employee including:
 - 21.3.1. The name or identification of the employee tested;
 - 21.3.2. Type of fit test performed;
 - 21.3.3. Specific make, model, style, and size of respirator tested;
 - 21.3.4. Date of test; and
 - 21.3.5. The pass/fail results for QLFTs or the fit factor and strip chart recording or other recording of the test results for QNFTs.
- 21.4. Fit test records will be retained for respirator users until the next fit test is administered.
- 21.5. A written copy of the current respirator program will be retained by the Safety Coordinator.
- 21.6. Written materials required to be retained under this program will be made available upon request to affected employees and to the Assistant Secretary or designee for examination and copying.

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Applicable OSHA Standard: 29 CFR 1910.1200, 1926.59

1. Purpose & Scope

- 1.1 The purpose of this program is to ensure that the hazards of all chemicals produced or imported are evaluated, and that information concerning their hazards is transmitted to Columbia Environmental Services, Inc. and its employees.
- 1.2 This program applies to any chemical which is known to be present in any Columbia Environmental Services, Inc. workplace in such a manner that employees may be exposed under normal conditions of use or in a foreseeable emergency.

2. General Requirements

- 2.1 The following written Hazard Communication Program is to be implemented for personnel of Columbia Environmental Services, Inc.. Information about this program, any hazardous chemicals at their work location and training about the program will be provided to employees prior to work assignment. This program will be reviewed when new processes or work assignments require changes or updating, and at least annually to be changed or updated as required.
- 2.2 The company's Safety Representative will be responsible for ensuring the program is current and enforced. The Site Supervisor is responsible for ensuring that the program is effectively implemented at the supervisor's work location.
- 2.3 A copy of this program will be made available to an employee(s) upon hiring. Copies may also be obtained on written request from an employee or a designated representative. Requested copies will be provided in a timely manner. This program will also be available to the Assistant Secretary of Labor for Occupational Safety and Health, U.S. Department of Labor, or designee, and the Director, National Institute for Occupational Safety and Health, U.S. Department of Health and Human Services, or designee.
- 2.4 The site Safety Representative will be contacted when a copy of the program is needed.
- 2.5 The program will be updated when new chemicals or hazards are introduced into the working environment, and reviewed annually.
- 2.6 Material Safety Data Sheets will be required at the time that any chemical product for use in the company workplace is purchased and obtained upon receipt of the chemical product.

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2.7 Specific operations in the company workplace where hazardous chemicals are used include:

2.7.1 Vehicle, tools and equipment operations requiring use of fuels and lubricants

2.7.2 Surface preparation, painting and coating operations requiring the use of abrasive blasting chemical products, paints, solvents and other necessary chemical products welding and hot work where welding rods, solders and other chemical products are required for welding and hot work processes

2.8 A Right To Know Station will be established at each company work location. The station will be prominently displayed at a place where all employees in the area will have immediate and ready access to station contents for information and in case of emergency. A copy of the company's written Hazard Communication Program, a Chemical Inventory listing all chemicals authorized by the company for use at the work location, and current copies of the Material Safety Sheet (MSDS) for each chemical product listed in the Chemical Inventory will be maintained at the station. A master Right To Know Station will also be maintained at the corporate office and shop facility to employees, their designated representatives, the Assistant Secretary & the Director in accordance with the requirements of 29 CFR 1910.1020(e).

2.9 Supervisors and other company employees at a work location will be constantly aware of signs and indications of a potential spill or some other accidental release of chemical product in the workplace. Generally, chemical spills and release are noticed visually by observation or because an odor suspected to be from a chemical is noticed. Any such suspicion will be reported to the Site Supervisor immediately so that emergency response, containment and proper clean-up can be accomplished. Industrial hygiene monitoring and monitoring devices operated by qualified personnel will also be used as required to detect the presence of chemicals, fumes and vapors.

2.10 The program will be updated when new chemicals or hazards are introduced into the working environment, and reviewed annually.

2.11 Supervisors and employees will be aware of the physical and health hazards of chemicals present in the work location through review of MSDS.

2.12 MSDS and container labeling will be the primary reference information about: preventing exposures; safe work practices; proper selection and use of PPE for working with a chemical product; safe storage of chemical products; properties of the chemical product; emergency and containment/clean-up procedures in the event of a spill or release; and other types of information that is contained in an MSDS.

3. Container Labeling

3.1 The Site Supervisor will be responsible for all containers of hazardous chemicals entering the workplace and will assure that the chemical containers are properly labeled with:

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3.1.1 Chemical name, including product name and identity of the chemical;

3.1.2 Hazard warnings about the chemical;

3.1.3 Name and address of the manufacturer, importer, or responsible party; and

3.1.4 HMIS® labels properly marked (see sample tag at right)



3.2 Chemical containers other than the original product container will be checked and approved by the Site Supervisor or a competent person and the MSDS reviewed to ensure the safety of the alternate container. The Site Supervisor will ensure that the new container is properly labeled; i.e., that all secondary containers are labeled with an extra copy of the original manufacturer's label or with generic labels which have a block for identity and blocks for the hazard warning. For help with labeling, employees will contact the Site Supervisor and, if additional assistance is required, the company's Safety Coordinator. The Safety Coordinator will review the labeling system annually as part of the annual review of this Hazard Communication Program and update as required.

3.3 The Site Supervisor will ensure that the contents of piping, gas and transmission lines are properly identified. The Site Supervisor will also inform employees of the hazards associated with chemicals contained in piping within the work areas.

3.4 Company employees will not remove or deface chemical product labeling.

3.5 Chemical product labeling will be in English. At the same time, if employees on the work location do not speak English as their primary language, the information provided in labeling will be provided to these employees in their primary language.

4. Material Safety Data Sheets (MSDS)

4.1 The corporate office or Site Supervisor, whichever is in charge of purchasing a chemical product, will be responsible for obtaining an MSDS for each product. The Site Supervisor will maintain the MSDS system at the work location. The Site Supervisor will review incoming data sheets for new and significant health/safety information and will ensure that the new information is given to the affected employees. Copies of all MSDS will be kept by the Site Supervisor with copies displayed at the Right To Know Station at the location. The Site Supervisor and Safety Representative will review each MSDS annually for accuracy and completeness.

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4.2 The MSDS system will include:

4.2.1 Current master inventory list of all MSDS, indexed alphabetically and by vendor;

4.2.2 The identity used on the MSDS will be the same as used on the container label;

4.2.3 The chemical and common name of all ingredients determined to present a hazard will appear on all MSDS;

4.2.4 The MSDS will list:

4.2.4.1 The physical and chemical characteristics of the chemical including vapor pressure, flash point, etc.;

4.2.4.2 The fire, explosion, and reactivity hazard(s) of the chemical mixture including the boiling point, flash point and auto ignition temperature;

4.2.4.3 Health hazards of the chemical mixture including signs and symptoms of exposure and medical conditions recognized as aggravated by exposure with primary route(s) of entry;

4.2.4.4 Permissible exposure limit (PEL) or any other exposure limit used or recommended by the manufacturer, importer, or employer;

4.2.4.5 Whether on carcinogen listing (NTP) or has been found to be a potential carcinogen (IARC listing) or by OSHA (see Appendix A immediately following this program);

4.2.4.6 Control measures including fire, engineering, personal protective equipment;

4.2.4.7 General precautions for safe handling and use including protective measures during repair and maintenance and procedures for clean-up of spills and leaks;

4.2.4.8 Emergency and first aid procedures;

4.2.4.9 Date prepared or changed;

4.2.4.10 Name, address, telephone numbers of manufacturer, importer, or responsible party to call in an emergency.

4.3 The MSDS will be available for use by employees. Each Site Supervisor will keep a current copy of the program on file and in the location's Right To Know Station. New chemicals will not be used until a MSDS has been obtained and reviewed for health hazards by the Site Supervisor.

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5. Employee Training & Education

- 5.1 Before starting work, the respective Site Supervisor will go over with the new employee the hazard communication program and site-specific work plan, as well as each MSDS applicable to their job. This orientation may be supported with handouts, video tapes, etc. Before any new chemical is used, all effected employees will be informed of its use, will be instructed on safe use, and will be trained on hazards associated with the new chemical. All employees will attend additional training, as appropriate, to review the program and MSDS. Appropriate reference material will also be discussed during the training session(s).
- 5.2 The minimum orientation and training for a new employee is as follows:
 - 5.2.1 An overview of the requirements contained in the Hazard Communication standard, 29 CFR 1926.59;
 - 5.2.2 Chemicals present in their workplace operations;
 - 5.2.3 Location and availability of the written program;
 - 5.2.4 Location of MSDS file and location of hazardous chemicals inventory list.
 - 5.2.5 Physical and health effects of the hazardous chemicals listed on the inventory list of this program;
 - 5.2.6 Accepted work practices, required PPE, spill and leak procedures, emergency procedures and other protective measures to be used for the chemicals authorized for the workplace;
 - 5.2.7 Methods and observation techniques used to determine the presence or release of hazardous chemicals in the work area;
 - 5.2.8 How to lessen or prevent exposure to these hazardous chemicals through usage of control/work practices and personal protective equipment;
 - 5.2.9 Steps taken by the Company to lessen or prevent exposure to the chemicals listed on the inventory list; and
 - 5.2.10 Emergency procedures to follow if exposed to a chemical.
- 5.3 Prior to a new chemical being introduced into any section of the workplace, each affected employee will be given information and training as outlined above by the Site Supervisor. MSDS will be available prior to use.
- 5.4 After attending the training class, each employee will sign a form to verify that he or she attended the training, that the written plan is made available for review, and that the employee understands the plan.

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- 5.5 Before entering a job site, the Site Supervisor will ascertain what chemical hazards employees may be exposed to and then take appropriate action to protect the employees. If an employee has any question about what protection is needed, he or she should contact the Site Supervisor or site Safety Representative immediately.

6. Non-Routine Tasks

- 6.1 Before any non-routine task is performed, employees will contact the Site Supervisor for special precautions to follow as required. Also, the supervisor will inform any other personnel who could be exposed. Non-routine task situations include unlabeled pipes, gas and transmission lines at the work location.
- 6.2 In the event that a non-routine task is expected to present a chemical exposure, the Site Supervisor will provide the following information as it relates to the task and the specific chemicals that may be encountered:
- 6.2.1 Specific chemical name(s) and hazard(s);
 - 6.2.2 Protective equipment required and safety measures to be taken;
 - 6.2.3 Measures that have been taken to lessen the hazards (i.e. ventilation);
 - 6.2.4 Presence of other personnel in the area; and
 - 6.2.5 Emergency response procedures.

7. Multi-Employer Workplaces

- 7.1 If Company employees at the work location produce, use or store hazardous chemicals in such a way that the personnel of another employer may be exposed (i.e. other contractors working on-site) the Site Superintendent will ensure that job-site hazard communication compliance includes the following:
- 7.1.1 Methods for providing personnel of other employers with on-site access to MSDS for each hazardous chemical that they may be exposed to while working;
 - 7.1.2 Methods used to inform personnel of other employers about any precautionary measures that need to be taken to protect themselves during normal workplace operations, as well as in the event of foreseeable emergencies; and,
 - 7.1.3 Methods used to inform personnel of other employers about the labeling system used in the workplace.

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8. Obtaining MSDS from Other Contractors

- 8.1 The Site Supervisor or Safety Representative will contact any other contractor working at a job site for information about chemicals they bring to the work location that may affect Company employees. MSDS will be obtained from the other contractor, as required, before Company employees begin work.

APPENDIX A

The following chemicals are regulated by OSHA as carcinogens in substance-specific standards that include labeling requirements.

- Asbestos
- 4-Nitrobyphenyl
- Alpha-Naphthylamine
- Methyl Chloromethyl Ether
- 3,3 Dichlorobenzidine (and its salts)
- Bis-Chloromethyl Ether
- Beta-Naphthylamine
- Benzidine
- 4-Aminodiphenyl
- Ethyleneimine
- Beta-Propiolactone
- 2-Acetylaminofluorene
- 4-Dimethylaminoazobenzene
- N-Nitrosodimethylamine
- Vinyl Chloride (and poly-vinyl Chloride)
- Inorganic Arsenic
- 1,2 Dibromo-3-Chloropropane
- Acrylonitrile
- Ethylene Oxide
- Formaldehyde
- Benzene

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Applicable OSHA Standards: 29 CFR 1926.500

1. Purpose & Scope

- 1.1. This policy sets forth requirements and criteria for fall protection in construction workplaces covered under 29 CFR part 1926. Exception: The provisions of this policy do not apply when employees are making an inspection, investigation, or assessment of workplace conditions prior to the actual start of construction work or after all construction work has been completed.
- 1.2. This policy applies to all employees and subcontractors working within Columbia Environmental Services, Inc. controlled job sites.

2. Definitions

- 2.1. "Anchorage" means a secure point of attachment for lifelines, lanyards or deceleration devices.
- 2.2. "Body belt (safety belt)" means a strap with means both for securing it about the waist and for attaching it to a lanyard, lifeline, or deceleration device.
- 2.3. "Body harness" means straps which may be secured about the employee in a manner that will distribute the fall arrest forces over at least the thighs, pelvis, waist, chest and shoulders with means for attaching it to other components of a personal fall arrest system.
- 2.4. "Buckle" means any device for holding the body belt or body harness closed around the employee's body.
- 2.5. "Connector" means a device which is used to couple (connect) parts of the personal fall arrest system and positioning device systems together. It may be an independent component of the system, such as a carabineer, or it may be an integral component of part of the system (such as a buckle or Dee-ring sewn into a body belt or body harness, or a snap-hook spliced or sewn to a lanyard or self-retracting lanyard).
- 2.6. "Controlled access zone (CAZ)" means an area in which certain work (e.g., overhand bricklaying) may take place without the use of guardrail systems, personal fall arrest systems, or safety net systems and access to the zone is controlled.
- 2.7. "Dangerous equipment" means equipment (such as pickling or galvanizing tanks, degreasing units, machinery, electrical equipment, and other units) which, as a result of form or function, may be hazardous to employees who fall onto or into such equipment.
- 2.8. "Deceleration device" means any mechanism, such as a rope grab, rip-stitch lanyard, specially-woven lanyard, tearing or deforming lanyards, automatic self-retracting lifelines/lanyards, etc., which serves to dissipate a substantial amount of energy

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during a fall arrest, or otherwise limit the energy imposed on an employee during fall arrest.

- 2.9. "Deceleration distance" means the additional vertical distance a falling employee travels, excluding lifeline elongation and free fall distance, before stopping, from the point at which the deceleration device begins to operate. It is measured as the distance between the location of an employee's body belt or body harness attachment point at the moment of activation (at the onset of fall arrest forces) of the deceleration device during a fall, and the location of that attachment point after the employee comes to a full stop.
- 2.10. "Equivalent" means alternative designs, materials, or methods to protect against a hazard which the employer can demonstrate will provide an equal or greater degree of safety for employees than the methods, materials or designs specified in the standard.
- 2.11. "Failure" means load refusal, breakage, or separation of component parts. Load refusal is the point where the ultimate strength is exceeded.
- 2.12. "Free fall" means the act of falling before a personal fall arrest system begins to apply force to arrest the fall.
- 2.13. "Free fall distance" means the vertical displacement of the fall arrest attachment point on the employee's body belt or body harness between onset of the fall and just before the system begins to apply force to arrest the fall. This distance excludes deceleration distance, and lifeline/lanyard elongation, but includes any deceleration device slide distance or self-retracting lifeline/lanyard extension before they operate and fall arrest forces occur.
- 2.14. "Guardrail system" means a barrier erected to prevent employees from falling to lower levels.
- 2.15. "Hole" means a gap or void 2 inches (5.1 cm) or more in its least dimension, in a floor, roof, or other walking/working surface.
- 2.16. "Infeasible" means that it is impossible to perform the construction work using a conventional fall protection system (i.e., guardrail system, safety net system, or personal fall arrest system) or that it is technologically impossible to use any one of these systems to provide fall protection.
- 2.17. "Lanyard" means a flexible line of rope, wire rope, or strap which generally has a connector at each end for connecting the body belt or body harness to a deceleration device, lifeline, or anchorage.
- 2.18. "Leading edge" means the edge of a floor, roof, or formwork for a floor or other walking/working surface (such as the deck) which changes location as additional floor, roof, decking, or formwork sections are placed, formed, or constructed. A

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leading edge is considered to be an "unprotected side and edge" during periods when it is not actively and continuously under construction.

- 2.19. "Lifeline" means a component consisting of a flexible line for connection to an anchorage at one end to hang vertically (vertical lifeline), or for connection to anchorages at both ends to stretch horizontally (horizontal lifeline), and which serves as a means for connecting other components of a personal fall arrest system to the anchorage.
- 2.20. "Low-slope roof" means a roof having a slope less than or equal to 4 in 12 (vertical to horizontal).
- 2.21. "Lower levels" means those areas or surfaces to which an employee can fall. Such areas or surfaces include, but are not limited to, ground levels, floors, platforms, ramps, runways, excavations, pits, tanks, material, water, equipment, structures, or portions thereof.
- 2.22. "Mechanical equipment" means all motor or human propelled wheeled equipment used for roofing work, except wheelbarrows and mop carts.
- 2.23. "Opening" means a gap or voids 30 inches (76 cm) or more high and 18 inches (48 cm) or more wide, in a wall or partition, through which employees can fall to a lower level.
- 2.24. "Personal fall arrest system" means a system used to arrest an employee in a fall from a working level. It consists of an anchorage, connectors, a body belt or body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations of these. As of January 1, 1998, the use of a body belt for fall arrest is prohibited.
- 2.25. "Positioning device system" means a body belt or body harness system rigged to allow an employee to be supported on an elevated vertical surface, such as a wall, and work with both hands free while leaning.
- 2.26. "Rope grab" means a deceleration device which travels on a lifeline and automatically, by friction, engages the lifeline and locks so as to arrest the fall of an employee. A rope grab usually employs the principle of inertial locking, cam/level locking, or both.
- 2.27. "Roof" means the exterior surface on the top of a building. This does not include floors or formwork which, because a building has not been completed, temporarily becomes the top surface of a building.
- 2.28. "Roofing work" means the hoisting, storage, application, and removal of roofing materials and equipment, including related insulation, sheet metal, and vapor barrier work, but not including the construction of the roof deck.

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- 2.29. "Safety-monitoring system" means a safety system in which a competent person is responsible for recognizing and warning employees of fall hazards.
- 2.30. "Self-retracting lifeline/lanyard" means a deceleration device containing a drum-wound line which can be slowly extracted from, or retracted onto, the drum under slight tension during normal employee movement, and which, after onset of a fall, automatically locks the drum and arrests the fall.
- 2.31. "Snap hook" means a connector comprised of a hook-shaped member with a normally closed keeper, or similar arrangement, which may be opened to permit the hook to receive an object and, when released, automatically closes to retain the object. Snap hooks are generally one of two types:
- 2.31.1. The locking type with a self-closing, self-locking keeper which remains closed and locked until unlocked and pressed open for connection or disconnection; or
 - 2.31.1.1. The non-locking type with a self-closing keeper which remains closed until pressed open for connection or disconnection. As of January 1, 1998, the use of a non-locking snap hook as part of personal fall arrest systems and positioning device systems is prohibited.
- 2.32. "Steep roof" means a roof having a slope greater than 4 in 12 (vertical to horizontal).
- 2.33. "Toe board" means a low protective barrier that will prevent the fall of materials and equipment to lower levels and provide protection from falls for personnel.
- 2.34. "Unprotected sides and edges" means any side or edge (except at entrances to points of access) of a walking/working surface, e.g., floor, roof, ramp, or runway where there is no wall or guardrail system at least 39 inches (1.0 m) high.
- 2.35. "Walking/working surface" means any surface, whether horizontal or vertical on which an employee walks or works, including, but not limited to, floors, roofs, ramps, bridges, runways, formwork and concrete reinforcing steel but not including ladders, vehicles, or trailers, on which employees must be located in order to perform their job duties.
- 2.36. "Warning line system" means a barrier erected on a roof to warn employees that they are approaching an unprotected roof side or edge, and which designates an area in which roofing work may take place without the use of guardrail, body belt, or safety net systems to protect employees in the area.
- 2.37. "Work area" means that portion of a walking/working surface where job duties are being performed.

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3. General

- 3.1. Fall protection is required whenever employees are potentially exposed to falls from heights of 6 feet or greater to lower levels. This includes work near and around excavations.
- 3.2. Use of guard rails, safety net, or personal fall arrest systems will be used as methods of fall protection when standard methods are not feasible or a greater hazard would be created by use of standard methods. Determination of employee exposure to fall hazards will be made without regard for the use of personal protective equipment.
- 3.3. Scaffolds, ladders or vehicle mounted work platforms may be utilized at a work location so long as employees have been sufficiently trained in the safe use of these devices and are authorized by the Site Supervisor for such work. Use of vehicle-mounted work platforms and scaffolding requires specific training for individual in charge of the work and users.
- 3.4. The Site Supervisor, in conjunction with the Company's Safety Representative, will determine if the walking or working surfaces on which employees are to work have the strength and structural integrity to support employees safely. Employees will be allowed to work on those surfaces only when the surfaces have the requisite strength and structural integrity.
- 3.5. Each employee on a walking/working surface (horizontal and vertical surface) with an unprotected side or edge which is 6 feet (1.8 m) or more above a lower level will be protected from falling by the use of guardrail systems, safety net systems, or personal fall arrest systems.
- 3.6. Each employee who is constructing a leading edge 6 feet (1.8 m) or more above lower levels will be protected from falling by guardrail systems, safety net systems, or personal fall arrest systems. Exception: When the Site Supervisor can demonstrate that it is infeasible or creates a greater hazard to use these systems, the Site Supervisor, in conjunction with the Company's Safety Representative, will develop and implement a fall protection plan which meets the requirements of paragraph (k) of 1926.502.
- 3.7. Each employee on a walking/working surface 6 feet (1.8 m) or more above a lower level where leading edges are under construction, but who is not engaged in the leading edge work, will be protected from falling by a guardrail system, safety net system, or personal fall arrest system. If a guardrail system is chosen to provide the fall protection, and a controlled access zone has already been established for leading edge work, the control line may be used in lieu of a guardrail along the edge that parallels the leading edge.
- 3.8. Each employee in a hoist area will be protected from falling 6 feet (1.8 m) or more to lower levels by guardrail systems or personal fall arrest systems. If guardrail systems, [or chain, gate, or guardrail] or portions thereof, are removed to facilitate the hoisting operation (e.g., during landing of materials), and an employee must lean

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through the access opening or out over the edge of the access opening (to receive or guide equipment and materials, for example), that employee will be protected from fall hazards by a personal fall arrest system.

- 3.9. Each employee on walking/working surfaces will be protected from falling through holes (including skylights) more than 6 feet (1.8 m) above lower levels, by personal fall arrest systems, covers, or guardrail systems erected around such holes.
- 3.10. Each employee on a walking/working surface will be protected from tripping in or stepping into or through holes (including skylights) by covers.
- 3.11. Each employee on a walking/working surface will be protected from objects falling through holes (including skylights) by covers.
- 3.12. Each employee on the face of formwork or reinforcing steel will be protected from falling 6 feet (1.8 m) or more to lower levels by personal fall arrest systems, safety net systems, or positioning device systems.
- 3.13. Each employee on ramps, runways, and other walkways will be protected from falling 6 feet (1.8 m) or more to lower levels by guardrail systems.
- 3.14. Each employee at the edge of an excavation 6 feet (1.8 m) or more in depth will be protected from falling by guardrail systems, fences, or barricades when the excavations are not readily seen because of plant growth or other vision barrier.
- 3.15. Each employee at the edge of a well, pit, shaft, and similar excavation 6 feet (1.8m) or more in depth will be protected from falling by guardrail systems, fences, barricades, or covers.
- 3.16. Each employee less than 6 feet (1.8 m) above dangerous equipment will be protected from falling into or onto the dangerous equipment by guardrail systems or by equipment guards.
- 3.17. Each employee 6 feet (1.8 m) or more above dangerous equipment will be protected from fall hazards by guardrail systems, personal fall arrest systems, or safety net systems.
- 3.18. Each employee reaching more than 10 inches (25 cm) below the level of the walking/working surface on which they are working will be protected from falling by a guardrail system, safety net system, or personal fall arrest system.
- 3.19. Each employee engaged in roofing activities on low-slope roofs, with unprotected sides and edges 6 feet (1.8 m) or more above lower levels will be protected from falling by guardrail systems, safety net systems, personal fall arrest systems, or a combination of warning line system and guardrail system, warning line system and safety net system, or warning line system and personal fall arrest system, or warning line system and safety monitoring system. Or, on roofs 50-feet (15.25 m) or less in

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width the use of a safety monitoring system alone [i.e. without the warning line system] is permitted.

- 3.20. Each employee on a steep roof with unprotected sides and edges 6 feet (1.8 m) or more above lower levels will be protected from falling by guardrail systems with toe boards, safety net systems, or personal fall arrest systems.
- 3.21. Each employee engaged in the erection of pre-cast concrete members (including, but not limited to the erection of wall panels, columns, beams, and floor and roof "tees") and related operations such as grouting of pre-cast concrete members, who is 6 feet (1.8 m) or more above lower levels will be protected from falling by guardrail systems, safety net systems, or personal fall arrest systems.
- 3.22. Each employee working on, at, above, or near wall openings (including those with chutes attached) where the outside bottom edge of the wall opening is 6 feet (1.8 m) or more above lower levels and the inside bottom edge of the wall opening is less than 39 inches (1.0 m) above the walking/working surface, will be protected from falling by the use of a guardrail system, a safety net system, or a personal fall arrest system.
- 3.23. When an employee is exposed to falling objects, each employee will wear a hard hat and the Site Supervisor will implement one of the following measures:
 - 3.23.1. Erect toe boards, screens, or guardrail systems to prevent objects from falling from higher levels; or,
 - 3.23.2. Erect a canopy structure and keep potential fall objects far enough from the edge of the higher level so that those objects would not go over the edge if they were accidentally displaced; or,
 - 3.23.3. Barricade the area to which objects could fall, prohibit employees from entering the barricaded area, and keep objects that may fall far enough away from the edge of a higher level so that those objects would not go over the edge if they were accidentally displaced.
- 3.24. When fall protection is required for the protection of employees, a fall protection plan will be prepared by a qualified person and developed specifically for the site where the work is being performed. The plan must be maintained up to date.
- 3.25. When fall protection is required, a competent person will be assigned to: recognize fall hazards; warn employees if they are unaware of a fall hazard or are acting in an unsafe manner; be on same working surface and in visual sight; stay close enough for verbal communication; and not have other assignments that would distract the monitor's attention from the monitoring responsibilities.
- 3.26. When purchasing equipment and raw materials for use in fall protection systems applicable ANSI and ASTM requirements will be met.

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4. Guardrail Systems

- 4.1. Top edge height of top rails, or equivalent guardrail system members, will be 42 inches (1.1 m) plus or minus 3 inches (8 cm) above the walking/working level. When conditions warrant, the height of the top edge may exceed the 45-inch height, provided the guardrail system meets all other criteria of this paragraph.
- 4.2. Midrails, screens, mesh, intermediate vertical members, or equivalent intermediate structural members will be installed between the top edge of the guardrail system and the walking/working surface when there is no wall or parapet wall at least 21 inches (53 cm) high.
- 4.3. Midrails, when used, will be installed at a height midway between the top edge of the guardrail system and the walking/working level.
- 4.4. Screens and mesh, when used, will extend from the top rail to the walking/working level and along the entire opening between top rail supports.
- 4.5. Intermediate members (such as balusters), when used between posts, will be not more than 19 inches (48 cm) apart. Other structural members (such as additional midrails and architectural panels) will be installed so that there are no openings in the guardrail system that are more than 19 inches (.5 m) wide.
- 4.6. Guardrail systems will be capable of withstanding, without failure, a force of at least 200 pounds (890 N) applied within 2 inches (5.1 cm) of the top edge, in any outward or downward direction, at any point along the top edge.
- 4.7. Midrails, screens, mesh, intermediate vertical members, solid panels, and equivalent structural members will be capable of withstanding, without failure, a force of at least 150 pounds (666 N) applied in any downward or outward direction at any point along the mid-rail or other member.
- 4.8. Guardrail systems will be so surfaced as to prevent injury to an employee from punctures or lacerations, and to prevent snagging of clothing.
- 4.9. The ends of all top rails and midrails will not overhang the terminal posts, except where such overhang does not constitute a projection hazard.
- 4.10. Steel banding and plastic banding will not be used as top rails or midrails.
- 4.11. Top rails and midrails will be at least one-quarter inch (0.6 cm) nominal diameter or thickness to prevent cuts and lacerations. If wire rope is used for top rails, it will be flagged at not more than 6-foot intervals with high-visibility material.
- 4.12. When guardrail systems are used at hoisting areas, a chain, gate or removable guardrail section will be placed across the access opening between guardrail sections when hoisting operations are not taking place.

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- 4.13. When guardrail systems are used at holes, they will be erected on all unprotected sides or edges of the hole.
- 4.14. When guardrail systems are used around holes used for the passage of materials, the hole will have not more than two sides provided with removable guardrail sections to allow the passage of materials. When the hole is not in use, it will be closed over with a cover, or a guardrail system will be provided along all unprotected sides or edges.
- 4.15. When guardrail systems are used around holes which are used as points of access (such as ladder ways), they will be provided with a gate, or be so offset that a person cannot walk directly into the hole.
- 4.16. Guardrail systems used on ramps and runways will be erected along each unprotected side or edge.
- 4.17. Manila, plastic or synthetic rope being used for top rails or midrails will be inspected as frequently as necessary to ensure that it continues to meet the strength requirements of paragraph 3.6 of this section.
- 4.18. Safety nets may be used only after approval by the Company Safety Representative.

5. Personal Fall Arrest Systems

- 5.1. Connectors will be drop forged, pressed or formed steel, or made of equivalent materials.
- 5.2. Connectors will have a corrosion-resistant finish, and all surfaces and edges will be smooth to prevent damage to interfacing parts of the system.
- 5.3. D-rings and snap hooks will have a minimum tensile strength of 5,000 pounds (22.2 kN).
- 5.4. Snap hooks will be sized to be compatible with the member to which they are connected to prevent unintentional disengagement of the snap hook by depression of the snap hook keeper by the connected member, or will be a locking type snap hook designed and used to prevent disengagement of the snap hook by the contact of the snap hook keeper by the connected member. Effective January 1, 1998, only locking type snap hooks will be used.
- 5.5. Unless the snap hook is a locking type and designed for the following connections, snap hooks will not be engaged:
 - 5.5.1. Directly to webbing, rope or wire rope;
 - 5.5.2. To each other;
 - 5.5.3. To a d-ring to which another snap hook or other connector is attached;

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- 5.5.4. To a horizontal lifeline; or
- 5.5.5. To any object which is incompatibly shaped or dimensioned in relation to the snap hook such that unintentional disengagement could occur by the connected object being able to depress the snap hook keeper and release itself.
- 5.6. On suspended scaffolds or similar work platforms with horizontal lifelines which may become vertical lifelines, the devices used to connect to a horizontal lifeline will be capable of locking in both directions on the lifeline.
- 5.7. Horizontal lifelines will be designed, installed, and used, under the supervision of a qualified person, as part of a complete personal fall arrest system, which maintains a safety factor of at least two.
- 5.8. Lanyards and vertical lifelines will have a minimum breaking strength of 5,000 pounds (22.2 kN).
- 5.9. Lifelines will be protected against being cut or abraded.
- 5.10. Self-retracting lifelines and lanyards which automatically limit free fall distance to 2 feet (0.61 m) or less will be capable of sustaining a minimum tensile load of 3,000 pounds (13.3 kN) applied to the device with the lifeline or lanyard in the fully extended position.
- 5.11. Self-retracting lifelines and lanyards which do not limit free fall distance to 2 feet (0.61 m) or less, rip stitch lanyards, and tearing and deforming lanyards will be capable of sustaining a minimum tensile load of 5,000 pounds (22.2 kN) applied to the device with the lifeline or lanyard in the fully extended position.
- 5.12. Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body belts and body harnesses will be made from synthetic fibers.
- 5.13. Anchorages used for attachment of personal fall arrest equipment will be independent of any anchorage being used to support or suspend platforms and capable of supporting at least 5,000 pounds (22.2 kN) per employee attached, or will be designed, installed, and used as follows:
 - 5.13.1. As part of a complete personal fall arrest system which maintains a safety factor of at least two; and
 - 5.13.2. Under the supervision of a qualified person.
- 5.14. The attachment point of the body belt will be located in the center of the wearer's back. The attachment point of the body harness will be located in the center of the wearer's back near shoulder level, or above the wearer's head.

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- 5.15. Harnesses and components will be used only for employee protection (as part of a personal fall arrest system or positioning device system) and not to hoist materials.
- 5.16. Personal fall arrest systems and components subjected to impact loading will be immediately removed from service and will not be used again for employee protection until inspected and determined by the Company's Safety Representative to be undamaged and suitable for reuse.
- 5.17. Personal fall arrest systems will be inspected prior to each use for wear, damage and other deterioration, and defective components will be removed from service.
- 5.18. Personal fall arrest systems will not be attached to guardrail systems, nor will they be attached to hoists.

6. Positioning Device Systems

- 6.1. Positioning devices will be rigged so that an employee cannot free fall more than 2 feet (.9 m).
- 6.2. Positioning devices will be secured to an anchorage capable of supporting at least twice the potential impact load of an employee's fall or 3,000 pounds (13.3 kN), whichever is greater.
- 6.3. Positioning device systems will be inspected prior to each use for wear, damage, and other deterioration and defective components will be removed from service.

7. Warning Line Systems

- 7.1. Warning line systems may be used only after approval by the Company Safety Representative.

8. Controlled Access Zones

- 8.1. The fall protection plan will identify each location where conventional fall protection methods cannot be used. These locations will then be classified as controlled access zones.
- 8.2. When used to control access to areas where leading edge and other operations are taking place the controlled access zone will be defined by a control line or by any other means that restricts access.
- 8.3. When control lines are used, they will be erected not less than 6 feet (1.8 m) nor more than 25 feet (7.7 m) from the unprotected or leading edge.
- 8.4. The control line will extend along the entire length of the unprotected or leading edge and will be approximately parallel to the unprotected or leading edge.
- 8.5. The control line will be connected on each side to a guardrail system or wall.

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- 8.6. Each line will be flagged or otherwise clearly marked at not more than 6-foot (1.8 m) intervals with high-visibility material.
- 8.7. Each line will be rigged and supported in such a way that its lowest point (including sag) is not less than 39 inches (1 m) from the walking/working surface and its highest point is not more than 45 inches (1.3 m) [50 inches (1.3 m) when overhand bricklaying operations are being performed] from the walking/working surface.
- 8.8. Each line will have a minimum breaking strength of 200 pounds (.88 kN).
- 8.9. Controlled access zones may be used only after approval by the Company Safety Representative.

9. Safety Monitoring Systems

- 9.1. Where no other alternative measure has been implemented, the employer will implement a safety monitoring system in conformance with 1926.502(h).
- 9.2. Safety monitoring systems and their use will comply with the following provisions:
 - 9.2.1. The Company will designate a competent person to monitor the safety of other employees and the employer will ensure that the safety monitor complies with the following requirements:
 - 9.2.2. The safety monitor will be competent to recognize fall hazards;
 - 9.2.3. The safety monitor will warn the employee when it appears that the employee is unaware of a fall hazard or is acting in an unsafe manner;
 - 9.2.4. The safety monitor will be on the same walking/working surface and within visual sighting distance of the employee being monitored;
 - 9.2.5. The safety monitor will be close enough to communicate orally with the employee; and
 - 9.2.6. The safety monitor will not have other responsibilities which could take the monitor's attention from the monitoring function.
- 9.3. Mechanical equipment will not be used or stored in areas where safety monitoring systems are being used to monitor employees engaged in roofing operations on low-slope roofs.
- 9.4. No employee, other than an employee engaged in roofing work [on low-sloped roofs] or an employee covered by a fall protection plan, will be allowed in an area where an employee is being protected by a safety monitoring system.
- 9.5. Each employee working in a controlled access zone will be directed to comply promptly with fall hazard warnings from safety monitors.

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- 9.6. Safety monitoring systems may be used only after approval by the Company Safety Representative.

10. Covers

- 10.1. Covers for holes in floors, roofs, and other walking/working surfaces will meet the following requirements:
- 10.2. Covers located in roadways and vehicular aisles will be capable of supporting, without failure, at least twice the maximum axle load of the largest vehicle expected to cross over the cover.
- 10.3. All other covers will be capable of supporting, without failure, at least twice the weight of employees, equipment, and materials that may be imposed on the cover at any one time.
- 10.4. All covers will be secured when installed so as to prevent accidental displacement by the wind, equipment, or employees.
- 10.5. All covers will be color coded or they will be marked with the word "HOLE" or "COVER" to provide warning of the hazard.

11. Training

- 11.1. The Company provides a training program for each employee who might be exposed to fall hazards. Training will enable each employee to recognize the hazards of falling and will train each employee in the procedures to follow to minimize these hazards.
- 11.2. Training will be documented with written certification records showing the name of the person trained, time and date(s) of training, and the signature of the trainer. Record will also be made of the date on which the Company determined training was adequate.
- 11.3. Re-training will be conducted when deficiencies in training are noted, or procedures in the work change, and / or when fall protection systems or equipment modifications and changes render previous training obsolete.
- 11.4. The Site Supervisor will assure that a training program is in place for each employee who might be exposed to fall hazards. The program will enable each employee to recognize the hazards of falling and will train each employee in the procedures to be followed in order to minimize these hazards.
- 11.5. The Site Supervisor will assure that each employee has been trained, as necessary, by a competent person qualified in the following areas:
 - 11.5.1. The nature of fall hazards in the work area;

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- 11.5.2. The correct procedures for erecting, maintaining, disassembling, and inspecting the fall protection systems to be used;
- 11.5.3. The use and operation of guardrail systems, personal fall arrest systems, safety net systems, warning line systems, safety monitoring systems, controlled access zones, and other protection to be used;
- 11.5.4. The role of each employee in the safety monitoring system when this system is used;
- 11.5.5. The limitations on the use of mechanical equipment during the performance of roofing work on low-sloped roofs;
- 11.5.6. The correct procedures for the handling and storage of equipment and materials and the erection of overhead protection;
- 11.5.7. The role of employees in fall protection plans; and
- 11.5.8. The standards contained in 29 CFR 1926 Subpart M.
- 11.6. The Site Supervisor will verify compliance by preparing a written certification record. The written certification record will contain the name or other identity of the employee trained, the date(s) of the training, and the signature of the person who conducted the training.
- 11.7. When the Site Supervisor has reason to believe that any affected employee who has already been trained does not have the understanding and skill required by this policy, the Site Supervisor will ensure that each such employee is retrained.

12. Rescue Following A Fall

- 12.1. The Site Supervisor will assess the fall protection methods and equipment to be utilized, workplace situations and access to emergency responders, and develop a plan with site-specific procedures to provide for prompt rescue of employees in the event of a fall.
- 12.2. This process will include provisions to allow employees to rescue themselves when they are able.

13. Accident Investigation

- 13.1. In the event an employee falls, or some other related, serious incident occurs, (e.g., a near miss) the employer will investigate the circumstances of the fall or other incident to determine if the fall protection plan needs to be changed (e.g. new practices, procedures, or training) and will implement those changes to prevent similar types of falls or incidents.

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Applicable OSHA Standard: 29 CFR 1910.146, 1926.21(b) (6)

1. Purpose & Scope

- 1.1. This program contains requirements for practices and procedures for Columbia Environmental Services, Inc. to protect employees in general industry from the hazards of entry into permit-required confined spaces.
- 1.2. This program applies to all employees and subcontractors working within Company controlled worksites.

2. Definitions

- 2.1. "Attendant" means an individual stationed outside a permit-required confined space who monitors the authorized entrants and who performs all attendants' duties assigned in the employer's permit-required confined space program.
- 2.2. "Authorized entrant" means an employee who is authorized by the Company to enter a permit space.
- 2.3. "Confined space" means a space that:
 - 2.3.1. Is large enough and so configured that an employee can bodily enter and perform assigned work; and
 - 2.3.2. Has limited or restricted means for entry or exit (for example, tanks, vessels, silos, storage bins, hoppers, vaults, and pits are spaces that may have limited means of entry); and
 - 2.3.3. Is not designed for continuous employee occupancy
 - 2.3.4. Or has inadequate ventilation
- 2.4. "Entry" means the action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activities in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.
- 2.5. "Entry supervisor" means the person (such as the foreman, or crew chief) responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required by this Company.
- 2.6. "Isolation" means the process by which a permit space is removed from service and completely protected against the release of energy and material into the space by such means as: blanking or blinding; misaligning or removing sections of lines, pipes, or ducts; a double block and bleed system; lockout or tagout of all sources of energy; or blocking or disconnecting all mechanical linkages.

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3. General Requirements

- 3.1. The Site Supervisor will evaluate the workplace to determine if any spaces are permit-required confined spaces. The client may provide a list when working at remote locations.
- 3.2. If the workplace contains permit spaces, the Project Superintendent in conjunction with the Site Safety Supervisor/Representative and the client, will inform exposed employees, by posting danger signs or by any other equally effective means, of the existence and location of and the danger posed by the permit spaces.

NOTE: A sign reading DANGER -- PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER or using other similar language would satisfy the requirement for a sign.

- 3.3. If the Site Supervisor decides that Company employees will not enter permit spaces, effective measures will be taken to prevent employees from entering the permit spaces.
- 3.4. If the Site Supervisor decides that Company employees will enter permit spaces, a site specific written permit space program will be developed and implemented in accordance and compliance with the Company's and client's confined space entry procedures. The written program will be available for inspection by employees.
- 3.5. When there are changes in the use or configuration of a non-permit confined space that might increase the hazards to entrants, the employer will reevaluate that space and, if necessary, reclassify it as a permit-required confined space.
- 3.6. A space classified by the employer as a permit-required confined space may be reclassified as a non-permit confined space under the following procedures:
- 3.7. If the permit space poses no actual or potential atmospheric hazards and if all hazards within the space are eliminated without entry into the space, the permit space may be reclassified as a non-permit confined space for as long as the non-atmospheric hazards remain eliminated.
- 3.8. If it is necessary to enter the permit space to eliminate hazards, such entry will be performed under requirements of this program. If testing and inspection during that entry demonstrate that the hazards within the permit space have been eliminated, the permit space may be reclassified as a non-permit confined space for as long as the hazards remain eliminated.
- 3.9. The employer will document the basis for determining that all hazards in a permit space have been eliminated, through a certification that contains the date, the location of the space, and the signature of the person making the determination. The certification will be made available to each employee entering the space or to that employee's authorized representative.

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3.10. If hazards arise within a permit space that has been declassified to a non-permit space, each employee in the space will exit the space. The employer will then reevaluate the space and determine whether it must be reclassified as a permit space, in accordance with other applicable provisions.

3.10.1. When entrance covers are removed, the opening will be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects entering the space.

3.10.2. If the Site Supervisor has reason to believe that the measures taken under the permit space program may not protect employees, the supervisor will revise the program to correct deficiencies found to exist before subsequent entries are authorized. The Company Safety Representative will be informed about any such action and assist the Site Supervisor as needed in the revisions.

3.11. Examples of circumstances requiring the review of the permit space program include:

3.11.1. Any unauthorized entry of a permit space,

3.11.2. The detection of a permit space hazard not covered by the permit,

3.11.3. The detection of a condition prohibited by the permit,

3.11.4. The occurrence of an injury or near-miss during entry,

3.11.5. A change in the use or configuration of a permit space, and / or

3.11.6. Employee complaints about the effectiveness of the program.

4. Site Specific Written Program

4.1. Before entry into any confined space at any Company controlled worksite, a site specific written program must be developed.

4.2. The Site Supervisor will develop the site specific written program. The written program will be approved by the Company Safety Representative.

4.3. The site specific written program will comply with OSHA 29 CFR 1910.146 and contain the following elements:

4.3.1. Measures necessary to prevent unauthorized entry;

4.3.2. Methods used to identify and evaluate the hazards of permit spaces before employees enter them;

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- 4.3.3. Specify acceptable entry conditions;
- 4.3.4. Methods used in isolating the permit space;
- 4.3.5. Purging, inerting, flushing, or ventilating the permit space as necessary to eliminate or control atmospheric hazards;
- 4.3.6. Providing pedestrian, vehicle, or other barriers as necessary to protect entrants from external hazards;
- 4.3.7. Methods used to verify that conditions in the permit space are acceptable for entry throughout the duration of an authorized entry.
- 4.3.8. Identify testing and monitoring equipment needed to comply with the Company's written confined space entry safety program.
- 4.3.9. Identification of authorized entrants, attendants and entry supervisors.
- 4.3.10. Ventilating equipment needed to obtain acceptable entry conditions;
- 4.3.11. Communications equipment necessary.
- 4.3.12. Personal protective equipment insofar as feasible engineering and work practice controls do not adequately protect employees;
- 4.3.13. Lighting equipment needed to enable employees to see well enough to work safely and to exit the space quickly in an emergency;
- 4.3.14. Equipment, such as ladders, needed for safe ingress and egress by authorized entrants;
- 4.3.15. Rescue and emergency services provided.
- 4.3.16. Training provided to entry supervisors, authorized entrants and attendants.

5. Entry Procedure Guidelines

- 5.1. The following guidelines are provided to assist the Site Supervisor in preparing the site specific written program.
- 5.2. Any conditions making it unsafe to remove an entrance cover will be eliminated before the cover is removed.
- 5.3. Lockout /Tag out procedures must be followed during a permit-required confined space entry.
- 5.4. All entrants must wear a safety harness with retrieval rope attached to the d-ring on the back of the harness.

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Note: More often, it is the responsibility of the client to prepare a confined space for entry. Procedures must be developed to ensure that information concerning the preparation of confined spaces by the client is communicated to Company personnel.

- 5.5. When entrance covers are removed, the opening will be promptly guarded by a railing, temporary cover, or other temporary barrier that will prevent an accidental fall through the opening and that will protect each employee working in the space from foreign objects entering the space.
- 5.6. Before an employee enters the space, the internal atmosphere will be tested, with a calibrated direct-reading instrument, for the following conditions in the order given:
 - 5.6.1. Oxygen content,
 - 5.6.2. Flammable gases and vapors, and
 - 5.6.3. Potential toxic air contaminants.
- 5.7. The entry supervisor who performs monitoring of the confined space will notify entrants of the potential hazards and monitoring results. Entrants will be involved and participate in the process of reviewing the written permit and signing of the permit.
- 5.8. Employees or their representatives are entitled to request additional monitoring at any time during the confined space entry operation.
- 5.9. Individuals will not enter a confined space that is immediately hazardous to life or health. Initial testing to determine potential hazards that require entry will have an approved and documented Standard Operating Procedure with a two-level approval - one of which must be the Site Superintendent and the other the Company Safety Representative.
- 5.10. There will be no hazardous atmosphere within the space whenever any employee is inside the space.
- 5.11. An employee may not enter the space until the forced air ventilation has eliminated any hazardous atmosphere. The forced air ventilation will be so directed as to ventilate the immediate areas where an employee is or will be present within the space and will continue until all employees have left the space. The air supply for the forced air ventilation will be from a clean source and may not increase the hazards in the space.
- 5.12. The atmosphere within the space will be continually tested to ensure that the continuous forced air ventilation is preventing the accumulation of a hazardous atmosphere and providing sufficient oxygen to the worker.

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- 5.13. If a hazardous atmosphere is detected during entry, each employee will leave the space immediately. The space will be evaluated to determine how the hazardous atmosphere developed and measures will be implemented to protect employees from the hazardous atmosphere before any subsequent entry takes place.
- 5.14. The entry supervisor will verify that the space is safe for entry and that the pre-entry measures required by this Company program have been taken, through a written certification that contains the date, the location of the space, and the signature of the person providing the certification. The certification will be made before entry and will be made available to each employee entering the space. This can be accomplished by means of an entry permit provided by the client.
- 5.15. The Site Supervisor will designate the persons who are to have active roles (as, for example, authorized entrants, attendants, entry supervisors, or persons who test or monitor the atmosphere in a permit space) in entry operations, identify the duties of each such employee, and provide each such employee with the training required by this Company program.
- 5.16. This Company will provide at least one attendant outside the permit space into which entry is authorized for the duration of entry operations.
- 5.17. If multiple spaces are to be monitored by a single attendant, include in the permit program the means and procedures to enable the attendant to respond to an emergency affecting one or more of the permit spaces being monitored without distraction from the attendant's responsibilities under this program;
- 5.18. The Site Superintendent in conjunction with the Company Safety Representative and the client will develop and implement procedures for summoning rescue and emergency services, for rescuing entrants from permit spaces, for providing necessary emergency services to rescued employees, and for preventing unauthorized personnel from attempting a rescue. Emergency equipment must be inspected prior to any entrance into the confined space.
- 5.19. If an entrant is in need of rescue, the attendant's sole responsibility is to sound the alarm to evacuate any other entrants and summon emergency personnel. Under no circumstance will an attendant enter the confined space by himself.
- 5.20. Before entry begins, the entry supervisor identified on the permit will sign the entry permit to authorize entry;
- 5.21. The completed permit will be made available at the time of entry to all authorized entrants, by posting it at the entry portal or by any other equally effective means; so that the entrants can confirm that pre-entry preparations have been completed.
- 5.22. All entrants must be signed in and out by the attendant every time they enter or exit the confined space.

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5.23. The duration of the permit may not exceed the time required to complete the assigned task or job identified on the permit.

5.24. The entry supervisor will terminate entry and cancel the entry permit when:

5.24.1. The entry operations covered by the entry permit have been completed; or

5.24.2. A condition that is not allowed under the entry permit arises in or near the permit space.

5.24.3. The work area emergency system is activated

5.25. When the Company arranges to have employees of another employer (contractor) perform work that involves permit space entry, the Company will:

5.25.1. Inform the contractor that the workplace contains permit spaces and that permit space entry is allowed only through compliance with a permit space program meeting the requirements of this Company program;

5.25.2. Apprise the contractor of the elements, including the hazards identified and the Company's experience with the space, that makes the space in question a permit space;

5.25.3. Apprise the contractor of any precautions or procedures that the Company has implemented for the protection of employees in or near permit spaces where contractor personnel will be working;

5.25.4. Coordinate entry operations with the contractor, when both Company personnel and contractor personnel will be working in or near permit spaces; and

5.25.5. Debrief the contractor at the conclusion of the entry operations regarding the permit space program followed and regarding any hazards confronted or created in permit spaces during entry operations.

6. Training

6.1. The Company will provide training so that all employees whose work is regulated by Company and OSHA safety requirements for entering and working in confined spaces will acquire the understanding, knowledge, and skills necessary for the safe performance of the duties assigned under this section.

6.2. The training will establish employee proficiency in the duties required by this section and will introduce new or revised procedures, as necessary, for compliance with this program.

6.3. The employer will certify that the training required by this program has been accomplished. The certification will contain each employee's name, the signatures or

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initials of the trainers, and the dates of training. The certification will be available for inspection by employees and their authorized representatives.

- 6.4. The Company Safety Representative will ensure that training is provided so that all employees whose work is regulated by this Company program acquire the understanding, knowledge, and skills necessary for the safe performance of the duties assigned under this section.
- 6.5. Training will be provided to each affected employee:
 - 6.5.1. Before the employee is first assigned duties under this Company program;
 - 6.5.1.1. Before there is a change in assigned duties;
 - 6.5.1.2. Whenever there is a change in permit space operations that presents a hazard about which an employee has not previously been trained;
 - 6.5.1.3. Whenever the Site Supervisor has reason to believe either that there are deviations from the permit space entry procedures required by this Company program or that there are inadequacies in the employee's knowledge or use of these procedures.
 - 6.5.2. The training will establish employee proficiency in the duties required by this Company program and will introduce new or revised procedures, as necessary, for compliance with this section.
 - 6.5.3. The Site Supervisor will certify that the training required by this Company program has been accomplished. The certification will contain each employee's name, the signatures or initials of the trainers, and the dates of training. The certification will be available for inspection by employees.
 - 6.5.4. The training will include the following:
 - 6.5.4.1. Duties of authorized entrants:
 - 6.5.4.1.1. Know the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;
 - 6.5.4.1.2. Properly use equipment as required by the permit.
 - 6.5.4.1.3. Communication method used with the attendant as necessary to enable the attendant to monitor entrant status and to enable the attendant to alert entrants of the need to evacuate the space.

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6.5.4.1.4. Alert the attendant whenever the entrant recognizes any warning sign or symptom of exposure to a dangerous situation, or the entrant detects a prohibited condition;

6.5.4.1.5. Exit from the permit space as quickly as possible whenever an order to evacuate is given by the attendant or the entry supervisor, the entrant recognizes any warning sign or symptom of exposure to a dangerous situation, the entrant detects a prohibited condition, or an evacuation alarm is activated.

6.5.4.2. Duties of attendants:

6.5.4.2.1. Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;

6.5.4.2.2. Is aware of possible behavioral effects of hazard exposure in authorized entrants;

6.5.4.2.3. Continuously maintains an accurate count of authorized entrants in the permit space and ensures that the means used to identify authorized entrants who are in the permit space is accurate;

6.5.4.2.4. Remains outside the permit space during entry operations until relieved by another attendant;

6.5.4.2.5. Communicates with authorized entrants as necessary to monitor entrant status and to alert entrants of the need to evacuate the space.

6.5.4.2.6. Monitors activities inside and outside the space to determine if it is safe for entrants to remain in the space and orders the authorized entrants to evacuate the permit space immediately under any of the following conditions:

6.5.4.2.6.1. If the attendant detects a prohibited condition;

6.5.4.2.6.2. If the attendant detects the behavioral effects of hazard exposure in an authorized entrant;

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- 6.5.4.2.6.3. If the attendant detects a situation outside the space that could endanger the authorized entrants; or
- 6.5.4.2.6.4. If the attendant cannot effectively and safely perform all the duties required under this Company program.
- 6.5.4.2.7. Summon rescue and other emergency services as soon as the attendant determines that authorized entrants may need assistance to escape from permit space hazards;
- 6.5.4.2.8. Takes the following actions when unauthorized persons approach or enter a permit space while entry is underway:
 - 6.5.4.2.8.1. Warn the unauthorized persons that they must stay away from the permit space;
 - 6.5.4.2.8.2. Advise the unauthorized persons that they must exit immediately if they have entered the permit space;
 - 6.5.4.2.8.3. Inform the authorized entrants and the entry supervisor if unauthorized persons have entered the permit space;
 - 6.5.4.2.8.4. Performs non-entry rescues as specified by the site specific written program rescue procedure; and
 - 6.5.4.2.8.5. Performs no duties that might interfere with the attendant's primary duty to monitor and protect the authorized entrants.
- 6.5.4.3. Duties of entry supervisors:
 - 6.5.4.3.1. Knows the hazards that may be faced during entry, including information on the mode, signs or symptoms, and consequences of the exposure;
 - 6.5.4.3.2. Verifies, by checking that the appropriate entries have been made on the permit, that all tests specified by the permit have been conducted and that all procedures and equipment specified by the permit are

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in place before endorsing the permit and allowing entry to begin;

- 6.5.4.3.3. Terminates the entry and cancels the permit as required;
- 6.5.4.3.4. Verifies that rescue services are available and that the means for summoning them are operable;
- 6.5.4.3.5. Removes unauthorized individuals who enter or who attempt to enter the permit space during entry operations; and
- 6.5.4.3.6. Determines, whenever responsibility for a permit space entry operation is transferred and at intervals dictated by the hazards and operations performed within the space that entry operations remain consistent with terms of the entry permit and that acceptable entry conditions are maintained.

7. Emergency Response & Rescue

- 7.1. The Site Supervisor will confirm in advance the availability of rescue and emergency services for immediate danger to life and health situations (IDLH) and have phone numbers available at the work location.
- 7.2. The Site Supervisor will also ensure that there is a reliable method of communication available at the work location (land-line telephone, cellular telephone, two-way radio) for summoning rescue and emergency services should they be needed.
- 7.3. If rescue and emergency personnel are not able to respond to a call for assistance in a timely manner, the Site Supervisor will obtain competent confined space rescue personnel to standby at the work location while confined space operations are in progress.
- 7.4. Rescue personnel will be trained, properly equipped and authorized by the Site Supervisor to perform this service. Unauthorized personnel will be prohibited from attempting a rescue.
- 7.5. When third-party rescue services are utilized for standby at the work location, service personnel will be allowed to survey the confined space work location, select and obtain specialized equipment as required, and decline the standby assignment if that is their choice.
- 7.6. When rescue and emergency services are being provided by the host employer, this must be stipulated and specified in the written contract that the host employer has accepted and signed.

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- 7.7. All personal protective equipment required when authorized and qualified employees perform rescue and emergency services will be provided by the Company at no cost to the individual employees assigned to this duty.
- 7.8. When authorized and qualified Company employees provide rescue and emergency services at confined space entry work locations, these individuals will be provided with training and hands-on practice rescues at least annually.
- 8. **Written Program Review**
 - 8.1. The Company Safety Representative will review the permit space program, using the canceled permits retained within one year after each entry and revise the program as necessary, to ensure that employees participating in entry operations are protected from permit space hazards.

Material Safety Data Sheets (MSDS)

Appendix E

Linde Gas

Linde Gas LLC (216) 642-6600
P.O. Box 94737
Cleveland, Ohio 44101
www.us.lindegas.com

**MATERIAL
SAFETY
DATA SHEET**

No. 155

PRODUCT NAME Vinyl Chloride	CAS # 75-01-4
TRADE NAME AND SYNONYMS Vinyl chloride, inhibited (D.O.T.)	DOT I.D. No.: UN 1086; RQ 1.0 (0.454)
CHEMICAL NAME AND SYNONYMS Vinyl Chloride, Chloroethylene; Chloroethene	DOT Hazard Class: Division 2.1
ISSUE DATES AND REVISIONS Revised January 1995	Formula C ₂ H ₃ Cl or CH ₂ CHCl
	Chemical Family: Halogenated Alkene

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT TWA = 5 molar ppm with an A1 Carcinogen Rating (ACGIH 1994-1995). AI is a confirmed human carcinogen. OSHA 1993. 1910.1017, 8 Hr. TWA = 1 Molar PPM (Continued on Page 4)
SYMPTOMS OF EXPOSURE Inhaling high concentrations causes mild symptoms of drowsiness, blurred vision, staggering gait and tingling and numbness in the extremities. Liquid vinyl chloride may cause severe irritation or burns on skin or eye contact.
TOXICOLOGICAL PROPERTIES Several workers who handled and used vinyl chloride developed a rare form of liver cancer. IARC, NTP and OSHA all list vinyl chloride as a carcinogen. Persons in ill health where such illness would be aggravated by exposure to vinyl chloride should not be allowed to work with or handle this product.
RECOMMENDED FIRST AID TREATMENT PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO VINYL CHLORIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE COGNIZANT OF EXTREME FIRE AND EXPLOSION HAZARD. Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given assisted respiration and supplemental oxygen. Further treatment should be symptomatic and supportive. (Continued on Page 4)

Information contained in this material safety data sheet is offered without charge for use by technically qualified personnel at their discretion and risk. All statements, technical information and recommendations contained herein are based on tests and data which we believe to be reliable, but the accuracy or completeness thereof is not guaranteed and no warranty of any kind is made with respect thereto. This information is not intended as a license to operate under or a recommendation to practice or infringe any patent of this Company or others covering any process, composition of matter or use.
Since the Company shall have no control of the use of the product described herein, the Company assumes no liability for loss or damage incurred from the proper or improper use of such product.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Vinyl chloride polymerizes on exposure to sunlight, heat or in the presence of oxygen or air. The addition of phenol or hydroquinone inhibits the polymerization. It is flammable in air.

PHYSICAL DATA

BOILING POINT 7.3°F (-13.7°C)	LIQUID DENSITY AT BOILING POINT 60.6 lb/ft³ (971 kg/m³)
VAPOR PRESSURE @ 70°F (21.1°C) = 52 psia (360 kPa)	GAS DENSITY AT 70°F, 1 atm @ 77°F (25°C) = .164 lb/ft³ (2.63 kg/m³)
SOLUBILITY IN WATER Slightly Soluble	FREEZING POINT -244.8°F (-153.8°C)
EVAPORATION RATE N/A (Gas)	SPECIFIC GRAVITY (AIR=1) @ 77°F (25°C) = 2.22
APPEARANCE AND ODOR Colorless gas with a pleasant, sweet odor	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) -108°F (CC)	AUTO IGNITION TEMPERATURE 882°F (472°C)	FLAMMABLE LIMITS % BY VOLUME (See Page 4) LEL 3.6 UEL 33
EXTINGUISHING MEDIA Water, dry chemical, carbon dioxide		ELECTRICAL CLASSIFICATION Class 1, Group Not Specified
SPECIAL FIRE FIGHTING PROCEDURES Attempt to stop the flow of vinyl chloride. Use water spray to cool surrounding containers.		
UNUSUAL FIRE AND EXPLOSION HAZARDS Vinyl chloride vapors are heavier than air and may travel a considerable distance to a source of ignition. Should fire be extinguished and flow of gas continue, increase ventilation to prevent formation of flammable mixtures in low areas or pockets.		

REACTIVITY DATA

STABILITY Unstable		CONDITIONS TO AVOID None
Stable	X	
INCOMPATIBILITY (Materials to avoid) Oxidizers		
HAZARDOUS DECOMPOSITION PRODUCTS None		
HAZARDOUS POLYMERIZATION May Occur	X	CONDITIONS TO AVOID It is inhibited with phenol or hydroquinone to prevent polymerization.
Will Not Occur		

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact your closest supplier location or call the emergency telephone number listed herein.
WASTE DISPOSAL METHOD Do not attempt to dispose of waste or unused quantities. Return in the shipping container <u>properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place</u> to your supplier. For emergency disposal assistance, contact your closest supplier location or call the emergency telephone number listed herein.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.		
VENTILATION Hood with forced ventilation	LOCAL EXHAUST To prevent accumulation above the TWA	SPECIAL N/A
	MECHANICAL (Gen.) In accordance with electrical codes	OTHER N/A
PROTECTIVE GLOVES Most materials except natural rubber		
EYE PROTECTION Safety goggles or glasses		
OTHER PROTECTIVE EQUIPMENT Safety shoes, safety shower, eyewash "fountain," transparent face shield		

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION		
DOT Shipping Name: Vinyl chloride, inhibited	I.D. No.:	UN 1086; RQ 1.0(0.454)
DOT Shipping Label: Flammable Gas	DOT Hazard Class:	Division 2.1
SPECIAL HANDLING RECOMMENDATIONS		
<p>Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<150 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.</p> <p>For additional handling recommendations, consult Compressed Gas Association's Pamphlets I P-1 and P-10.</p>		
SPECIAL STORAGE RECOMMENDATIONS		
<p>Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of noncombustible construction away from heavily trafficked areas and emergency exits.</p> <p>Do not allow the temperature where cylinders are stored to exceed 125F (52C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in - first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no sources of ignition in the storage or use area.</p> <p>For additional storage recommendations, consult Compressed Gas Association's Pamphlet P-1 and P-10.</p>		
SPECIAL PACKAGING RECOMMENDATIONS		
<p>Most metals except copper and its alloys may be used with vinyl chloride. Copper and its alloys could form explosive acetylides by reacting with the acetylene impurity in the product.</p> <p>Teflon® is the preferred gasketing material.</p>		
OTHER RECOMMENDATIONS OR PRECAUTIONS		
<p>Earth-ground and bond all lines and equipment associated with the vinyl chloride system. Electrical equipment should be non-sparking or explosion proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of federal Law (49CFR).</p>		

(Continued on Page 4)

*Various Government Agencies (i.e. Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

HEALTH HAZARD DATA

TWA DATA: (continued)

(<5 Molar PPM averaged over any period not exceeding 15 minutes) with the prohibition of any personal direct contact with vinyl chloride liquid and it is classified as a cancer suspect agent.

RECOMMENDED FIRST AID TREATMENT: (Continued)

Eye Contact: PERSONS WITH POTENTIAL EXPOSURE TO VINYL CHLORIDE SHOULD NOT WEAR CONTACT LENSES.

Flush contaminated eye(s) with copious quantities of water. Part eyelids with fingers to assure complete flushing. Continue for minimum of 15 minutes. An eye specialist should be summoned promptly.

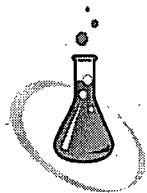
Skin Contact: Flush affected areas with copious quantities of water. Remove affected clothing as rapidly as possible. A physician should see the patient. Follow the water flush with a soap and water wash.

SPECIAL PRECAUTIONS

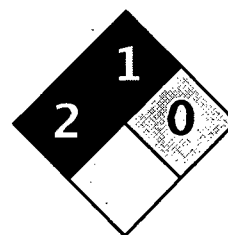
OTHER RECOMMENDATIONS OR PRECAUTIONS: (Continued)

Always secure cylinders in an upright position before transporting them. Never transport cylinders in trunks or vehicles, enclosed vans, truck cabs or in passenger compartments. Transport cylinders secured in open flatbed or in open pick-up type vehicles.

Vinyl chloride is a toxic chemical and it is subject to the reporting requirements of SARA, Title III, Section 313.



Science Lab.com
Chemicals & Laboratory Equipment



Health	2
Fire	1
Reactivity	0
Personal Protection	H

Material Safety Data Sheet Trichloroethylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Trichloroethylene

Catalog Codes: SLT3310, SLT2590

CAS#: 79-01-6

RTECS: KX4560000

TSCA: TSCA 8(b) inventory: Trichloroethylene

CI#: Not available.

Synonym:

Chemical Formula: C₂HCl₃

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: 1-800-901-7247
International Sales: 1-281-441-4400

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Trichloroethylene	79-01-6	100

Toxicological Data on Ingredients: Trichloroethylene: ORAL (LD50): Acute: 5650 mg/kg [Rat]. 2402 mg/kg [Mouse].
DERMAL (LD50): Acute: 20001 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH.

MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available.

The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract.

Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 420°C (788°F)

Flash Points: Not available.

Flammable Limits: LOWER: 8% UPPER: 10.5%

Products of Combustion: These products are carbon oxides (CO, CO₂), halogenated compounds.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

SMALL FIRE: Use DRY chemical powder.

LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:

Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the

product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:

Keep container dry: Keep in a cool place. Ground all equipment containing material. Carcinogenic, teratogenic or mutagenic materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 50 STEL: 200 (ppm) from ACGIH (TLV)

TWA: 269 STEL: 1070 (mg/m3) from ACGIH

Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 131.39 g/mole

Color: Clear Colorless.

pH (1% soln/water): Not available.

Boiling Point: 86.7°C (188.1°F)

Melting Point: -87.1°C (-124.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.4649 (Water = 1)

Vapor Pressure: 58 mm of Hg (@ 20°C)

Vapor Density: 4.53 (Air = 1)

Volatility: Not available.

Odor Threshold: 20 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; $\log(\text{oil/water}) = 0$

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, acetone.

Solubility:

Easily soluble in methanol, diethyl ether, acetone.

Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity:

Extremely corrosive in presence of aluminum.

Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

Acute oral toxicity (LD50): 2402 mg/kg [Mouse].

Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH.

The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in human. Detected in maternal milk in human.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Trichloroethylene : UN1710 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute:

Trichloroethylene

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Trichloroethylene

Pennsylvania RTK: Trichloroethylene

Florida: Trichloroethylene

Minnesota: Trichloroethylene

Massachusetts RTK: Trichloroethylene

New Jersey: Trichloroethylene

TSCA 8(b) inventory: Trichloroethylene

CERCLA: Hazardous substances.: Trichloroethylene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):

CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC).

CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R36/38- Irritating to eyes and skin.

R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves.

Lab coat.

Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.

Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

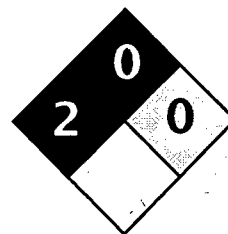
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Chemicals & Laboratory Equipment



Health	2
Fire	0
Reactivity	0
Personal Protection	G

Material Safety Data Sheet Tetrachloroethylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Tetrachloroethylene

Catalog Codes: SLT3220

CAS#: 127-18-4

RTECS: KX3850000

TSCA: TSCA 8(b) inventory: Tetrachloroethylene

CI#: Not available.

Synonym: Perchloroethylene; 1,1,2,2-Tetrachloroethylene; Carbon bichloride; Carbon dichloride; Ankilostin; Didakene; Dilatin PT; Ethene, tetrachloro-; Ethylene tetrachloride; Perawin; Perchlor; Perclene; Perclene D; Percosolve; Tetrachloroethene; Tetraleno; Tetralex; Tetravec; Tetroguer; Tetropil

Chemical Name: Ethylene, tetrachloro-

Chemical Formula: C₂-Cl₄

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Tetrachloroethylene	127-18-4	100

Toxicological Data on Ingredients: Tetrachloroethylene: ORAL (LD50): Acute: 2629 mg/kg [Rat]. DERMAL (LD): Acute: >3228 mg/kg [Rabbit]. MIST(LC50): Acute: 34200 mg/m 8 hours [Rat]. VAPOR (LC50): Acute: 5200 ppm 4 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of skin contact (irritant), of inhalation. Slightly hazardous in case of skin contact (permeator), of eye contact (irritant), of ingestion.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (anticipated carcinogen) by NTP.

MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available.

The substance may be toxic to kidneys, liver, peripheral nervous system, respiratory tract, skin, central nervous system (CNS).

Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:

Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with skin. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, metals, acids, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

Personal Protection:

Safety glasses. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 25 (ppm) from OSHA (PEL) [United States]

TWA: 25 STEL: 100 (ppm) from ACGIH (TLV) [United States]

TWA: 170 (mg/m³) from OSHA (PEL) [United States]

Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Ethereal.

Taste: Not available.

Molecular Weight: 165.83 g/mole

Color: Clear Colorless.

pH (1% soln/water): Not available.

Boiling Point: 121.3°C (250.3°F)

Melting Point: -22.3°C (-8.1°F)

Critical Temperature: 347.1°C (656.8°F)

Specific Gravity: 1.6227 (Water = 1)

Vapor Pressure: 1.7 kPa (@ 20°C)

Vapor Density: 5.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 5 - 50 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; $\log(\text{oil/water}) = 3.4$

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:

Miscible with alcohol, ether, chloroform, benzene, hexane.

It dissolves in most of the fixed and volatile oils.

Solubility in water: 0.015 g/100 ml @ 25 deg. C

It slowly decomposes in water to yield Trichloroacetic and Hydrochloric acids.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents, metals, acids, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Oxidized by strong oxidizing agents.

Incompatible with sodium hydroxide, finely divided or powdered metals such as zinc, aluminum, magnesium, potassium, chemically active metals such as lithium, beryllium, barium.

Protect from light.

Special Remarks on Corrosivity: Slowly corrodes aluminum, iron, and zinc.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.

Acute oral toxicity (LD50): 2629 mg/kg [Rat].

Acute dermal toxicity (LD50): >3228 mg/kg [Rabbit].

Acute toxicity of the vapor (LC50): 5200.4 hours [Mouse].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH. Classified 2A (Probable for human.) by IARC, 2 (Some evidence.) by NTP.

MUTAGENIC EFFECTS: Mutagenic for bacteria and/or yeast.

May cause damage to the following organs: kidneys, liver, peripheral nervous system, upper respiratory tract,

skin, central nervous system (CNS).

Other Toxic Effects on Humans:

Hazardous in case of skin contact (irritant), of inhalation.

Slightly hazardous in case of skin contact (permeator), of ingestion.

Special Remarks on Toxicity to Animals:

Lowest Published Lethal Dose/Conc:

LDL [Rabbit] - Route: Oral; Dose: 5000 mg/kg

LDL [Dog] - Route: Oral; Dose: 4000 mg/kg

LDL [Cat] - Route: Oral; Dose: 4000 mg/kg

Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive effects and birth defects(teratogenic).

May affect genetic material (mutagenic).

May cause cancer.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects:

Skin: Causes skin irritation with possible dermal blistering or burns. Symptoms may include redness, itching, pain, and possible dermal blistering or burns. It may be absorbed through the skin with possible systemic effects. A single prolonged skin exposure is not likely to result in the material being absorbed in harmful amounts.

Eyes: Contact causes transient eye irritation, lacrimation. Vapors cause eye/conjunctival irritation. Symptoms may include redness and pain.

Inhalation: The main route to occupational exposure is by inhalation since it is readily absorbed through the lungs. It causes respiratory tract irritation, . It can affect behavior/central nervous system (CNS depressant and anesthesia ranging from slight inebriation to death, vertigo, somnolence, anxiety, headache, excitement, hallucinations, muscle incoordination, dizziness, lightheadness, disorientation, seizures, emotional instability, stupor, coma). It may cause pulmonary edema

Ingestion: It can cause nausea, vomiting, anorexia, diarrhea, bloody stool. It may affect the liver, urinary system (proteinuria, hematuria, renal failure, renal tubular disorder), heart (arrhythmias). It may affect behavior/central nervous system with symptoms similar to that of inhalation.

Chronic Potential Health Effects:

Skin: Prolonged or repeated skin contact may result in excessive drying of the skin, and irritation.

Ingestion/Inhalation: Chronic exposure can affect the liver(hepatitis,fatty liver degeneration), kidneys, spleen, and heart (irregular heartbeat/arrhythmias, cardiomyopathy, abnormal EEG), brain, behavior/central nervous system/peripheral nervous system (impaired memory, numbness of extremities, peripheral neuropathy and other

Section 12: Ecological Information

Ecotoxicity:

Ecotoxicity in water (LC50): 18.4 mg/l 96 hours [Fish (Fathead Minnow)]. 18 mg/l 48 hours [Daphnia (daphnia)]. 5 mg/l 96 hours [Fish (Rainbow Trout)]. 13 mg/l 96 hours [Fish (Bluegill sunfish)].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification : Tetrachloroethylene UNNA: 1897 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute:

Tetrachloroethylene

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Tetrachloroethylene

Connecticut hazardous material survey.: Tetrachloroethylene

Illinois toxic substances disclosure to employee act: Tetrachloroethylene

Illinois chemical safety act: Tetrachloroethylene

New York release reporting list: Tetrachloroethylene

Rhode Island RTK hazardous substances: Tetrachloroethylene

Pennsylvania RTK: Tetrachloroethylene

Minnesota: Tetrachloroethylene

Michigan critical material: Tetrachloroethylene

Massachusetts RTK: Tetrachloroethylene

Massachusetts spill list: Tetrachloroethylene

New Jersey: Tetrachloroethylene

New Jersey spill list: Tetrachloroethylene

Louisiana spill reporting: Tetrachloroethylene

California Director's List of Hazardous Substances: Tetrachloroethylene

TSCA 8(b) inventory: Tetrachloroethylene

TSCA 8(d) H and S data reporting: Tetrachloroethylene: Effective date: 6/1/87; Sunset date: 6/1/97

SARA 313 toxic chemical notification and release reporting: Tetrachloroethylene

CERCLA: Hazardous substances.: Tetrachloroethylene: 100 lbs. (45.36 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC).

CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):

R40- Possible risks of irreversible effects.

R51/53- Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

S23- Do not breathe gas/fumes/vapour/spray

S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S37- Wear suitable gloves.

S61- Avoid release to the environment. Refer to special instructions/Safety data sheets.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: g

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves.

Lab coat.

Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.

Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

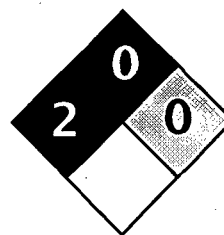
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Health	2
Fire	0
Reactivity	0
Personal Protection	H

Material Safety Data Sheet Chloroform MSDS

Section 1: Chemical Product and Company Identification

Product Name: Chloroform

Catalog Codes: SLC1888, SLC5044

CAS#: 67-66-3

RTECS: FS9100000

TSCA: TSCA 8(b) inventory: Chloroform

CI#: Not available.

Synonym: Trichloromethane; Methane, trichlor-

Chemical Name: Chloroform

Chemical Formula: CHCl₃

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Chloroform	67-66-3	100

Toxicological Data on Ingredients: Chloroform: ORAL (LD50): Acute: 695 mg/kg [Rat]. 36 mg/kg [Mouse]. 820 mg/kg [Guinea pig]. DERMAL (LD50): Acute: >20000 mg/kg [Rabbit]. VAPOR (LC50): Acute: 47702 mg/m 4 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects: CARCINOGENIC EFFECTS: Classified + (Proven.) by NIOSH. Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, heart. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention.

Skin Contact: In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact: Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation: Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances: Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: May explode if it comes in contact with aluminum powder, lithium, perchlorate, pentoxide, bis(dimethylamino)dimethylstannane, potassium, potassium-sodium alloy, sodium (or sodium hydroxide or sodium methoxide), and methanol

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions: Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as metals, alkalis.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area. Sensitive to light. Store in light-resistant containers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls: Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection: Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill: Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: TWA: 10 (ppm) [Australia] Inhalation TWA: 2 (ppm) from OSHA (PEL) [United States] Inhalation STEL: 9.78 (mg/m³) from NIOSH Inhalation STEL: 2 (ppm) from NIOSH Inhalation TWA: 9.78 (mg/m³) from OSHA (PEL) [United States] Inhalation TWA: 10 (ppm) from ACGIH (TLV) [United States] [1999] Inhalation TWA: 2 (ppm) [United Kingdom (UK)] Inhalation TWA: 9.9 (mg/m³) [United Kingdom (UK)] Inhalation Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Pleasant. Sweetish. Etheric. Non-irritating

Taste: Burning. Sweet.

Molecular Weight: 119.38 g/mole

Color: Colorless. Clear

pH (1% soln/water): Not available.

Boiling Point: 61°C (141.8°F)

Melting Point: -63.5°C (-82.3°F)

Critical Temperature: 263.33°C (506°F)

Specific Gravity: 1.484 (Water = 1)

Vapor Pressure: 21.1 kPa (@ 20°C)

Vapor Density: 4.36 (Air = 1)

Volatility: Not available.

Odor Threshold: 85 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatible materials, Light

Incompatibility with various substances: Reactive with metals, alkalis.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Light Sensitive. Incompatible with triisopropyl phosphine, acetone, disilane, fluorine, strong bases and reactive metals (aluminum, magnesium in powdered form), light.

Special Remarks on Corrosivity: It will attack some forms of plastics, rubber, and coatings.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Eye contact. Inhalation.

Toxicity to Animals: WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 36 mg/kg [Mouse]. Acute dermal toxicity (LD50): >20000 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 47702 mg/m 4 hours [Rat]. 3

Chronic Effects on Humans: CARCINOGENIC EFFECTS: Classified + (Proven.) by NIOSH. Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC. Classified 2 (Some evidence.) by NTP. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. May cause damage to the following organs: kidneys, liver, heart.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: May affect genetic material (possible mutagen) and cause adverse reproductive effects (embryotoxicity and fetotoxicity) Suspected carcinogen (tumorigenic) and teratogen based on animal data. Human: passes the placental barrier, detected in maternal milk.

Special Remarks on other Toxic Effects on Humans: Acute Potential Health Effects: Skin: Causes skin irritation and may cause chemical burns. Eye: Causes eye irritation, burning pain and reversible injury to corneal epithelium. Inhalation: Causes irritation of the respiratory system (mucous membranes). May affect behavior/Nervous system (CNS depressant, fatigue, dizziness, nervousness, giddiness, euphoria, loss of coordination and judgement, weakness, hallucinations, muscle contraction/spasticity, general anesthetic, spastic paralysis, headache), anorexia (neurological and gastrointestinal symptoms resembling chronic alcoholism), and possibly coma and death. May affect the liver, kidneys and gastrointestinal tract (nausea, vomiting). Ingestion: Causes gastrointestinal tract irritation (nausea, vomiting). May affect the liver, urinary system (kidneys), respiration, behavior/nervous system (symptoms similar to inhalation), and heart. Chronic Potential Health Effects: Inhalation: Prolonged or repeated inhalation may affect the liver (hepatitis, jaundice, hepatocellular necrosis), metabolism (weight loss), respiration (fibrosis, pneumoconiosis), behavior/central nervous system (symptoms similar to acute inhalation), blood, musculoskeletal system, and kidneys. Ingestion: Prolonged or repeated ingestion may affect the liver, kidneys, metabolism (weight loss), endocrine system (spleen), blood (changes in cell count).

Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 43.8 mg/l 96 hours [Trout].

BOD5 and COD: Not available.

Products of Biodegradation: Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are as toxic as the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal: Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Chloroform UNNA: UN1888 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations: California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Chloroform California prop. 65 (no significant risk level): Chloroform: 0.02 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Chloroform New York release reporting list: Chloroform Rhode Island RTK hazardous substances: Chloroform Pennsylvania RTK: Chloroform Massachusetts RTK: Chloroform New Jersey: Chloroform California Director's List of Hazardous Substances (8 CCR 339): Chloroform Tennessee: Chloroform TSCA 8(b) inventory: Chloroform TSCA 8(d) H and S data reporting: Chloroform: effective: 6/1/87; sunset: 6/1/97 SARA 302/304/311/312 extremely hazardous substances: Chloroform SARA 313 toxic chemical notification and release reporting: Chloroform CERCLA: Hazardous substances.: Chloroform: 10 lbs. (4.536 kg)

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada): CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

D\$CL (EEC): R20/22- Harmful by inhalation and if swallowed. R38- Irritating to skin. R40- Possible risks of irreversible effects. S36/37- Wear suitable protective clothing and gloves.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 0

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment: Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

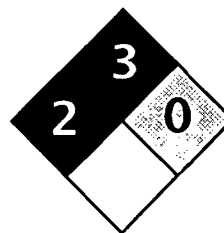
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Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet

Benzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Benzene

Catalog Codes: SLB1564, SLB3055, SLB2881

CAS#: 71-43-2

RTECS: CY1400000

TSCA: TSCA 8(b) inventory: Benzene

CI#: Not available.

Synonym: Benzol; Benzine

Chemical Name: Benzene

Chemical Formula: C₆-H₆

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Benzene	71-43-2	100

Toxicological Data on Ingredients: Benzene: ORAL (LD50): Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse]. DERMAL (LD50): Acute: >9400 mg/kg [Rabbit]. VAPOR (LC50): Acute: 10000 ppm 7 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of eye contact (irritant), of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC.

MUTAGENIC EFFECTS: Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE].

The substance is toxic to blood, bone marrow, central nervous system (CNS).

The substance may be toxic to liver, Urinary System.

Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

Skin Contact:

In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 497.78°C (928°F)

Flash Points: CLOSED CUP: -11.1°C (12°F). (Setaflash)

Flammable Limits: LOWER: 1.2% UPPER: 7.8%

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances:

Highly flammable in presence of open flames and sparks, of heat.
Slightly flammable to flammable in presence of oxidizing materials.
Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.
Explosive in presence of oxidizing materials, of acids.

Fire Fighting Media and Instructions:

Flammable liquid, soluble or dispersed in water.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:

Extremely flammable liquid and vapor. Vapor may cause flash fire.
Reacts on contact with iodine heptafluoride gas.

Dioxygenyl tetrafluoroborate is as very powerful oxidant. The addition of a small particle to small samples of benzene, at ambient temperature, causes ignition.

Contact with sodium peroxide with benzene causes ignition.

Benzene ignites in contact with powdered chromic anhydride.

Virgorous or incandescent reaction with hydrogen + Raney nickel (above 210 C) and bromine trifluoride.

Special Remarks on Explosion Hazards:

Benzene vapors + chlorine and light causes explosion.

Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate.

Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion.

Interaction of nitryl perchlorate with benzene gave a slight explosion and flash.

The solution of permanganic acid (or its explosive anhydride, dimaganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene.

Peroxodisulfuric acid is a very powerful oxidant. Uncontrolled contact with benzene may cause explosion.

Mixtures of peroxomonsulfuric acid with benzene explodes.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:

Flammable liquid.

Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV.

Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 0.5 STEL: 2.5 (ppm) from ACGIH (TLV) [United States]
TWA: 1.6 STEL: 8 (mg/m³) from ACGIH (TLV) [United States]
TWA: 0.1 STEL: 1 from NIOSH
TWA: 1 STEL: 5 (ppm) from OSHA (PEL) [United States]
TWA: 10 (ppm) from OSHA (PEL) [United States]
TWA: 3 (ppm) [United Kingdom (UK)]
TWA: 1.6 (mg/m³) [United Kingdom (UK)]
TWA: 1 (ppm) [Canada]
TWA: 3.2 (mg/m³) [Canada]
TWA: 0.5 (ppm) [Canada] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor:

Aromatic. Gasoline-like, rather pleasant.
(Strong.)

Taste: Not available.

Molecular Weight: 78.11 g/mole

Color: Clear Colorless. Colorless to light yellow.

pH (1% soln/water): Not available.

Boiling Point: 80.1 (176.2°F)

Melting Point: 5.5°C (41.9°F)

Critical Temperature: 288.9°C (552°F)

Specific Gravity: 0.8787 @ 15 C (Water = 1)

Vapor Pressure: 10 kPa (@ 20°C)

Vapor Density: 2.8 (Air = 1)

Volatility: Not available.

Odor Threshold: 4.68 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:

Miscible in alcohol, chloroform, carbon disulfide oils, carbon tetrachloride, glacial acetic acid, diethyl ether, acetone.

Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, incompatibles.

Incompatibility with various substances: Highly reactive with oxidizing agents, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Benzene vapors + chlorine and light causes explosion.

Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate.

Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion.

Interaction of nitryl perchlorate with benzene gave a slight explosion and flash.

The solution of permanganic acid (or its explosive anhydride, dimanganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene.

Peroxodisulfuric acid is a very powerful oxidant. Uncontrolled contact with benzene may cause explosion.

Mixtures of peroxomonsulfuric acid with benzene explodes.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.

Acute oral toxicity (LD50): 930 mg/kg [Rat].

Acute dermal toxicity (LD50): >9400 mg/kg [Rabbit].

Acute toxicity of the vapor (LC50): 10000 7 hours [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC.

MUTAGENIC EFFECTS: Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast.

DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE].

Causes damage to the following organs: blood, bone marrow, central nervous system (CNS).

May cause damage to the following organs: liver, Urinary System.

Other Toxic Effects on Humans:

Very hazardous in case of inhalation.

Hazardous in case of skin contact (irritant, permeator), of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive effects (female fertility, Embryotoxic and/or foetotoxic in animal) and birth defects.

May affect genetic material (mutagenic).

May cause cancer (tumorigenic, leukemia)

Human: passes the placental barrier, detected in maternal milk.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects:

Skin: Causes skin irritation. It can be absorbed through intact skin and affect the liver, blood, metabolism, and urinary system.

Eyes: Causes eye irritation.

Inhalation: Causes respiratory tract and mucous membrane irritation. Can be absorbed through the lungs. May affect behavior/Central and Peripheral nervous systems (somnolence, muscle weakness, general anesthetic, and

other symptoms similar to ingestion), gastrointestinal tract (nausea), blood metabolism, urinary system.
Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation including vomiting. May affect behavior/Central and Peripheral nervous systems (convulsions, seizures, tremor, irritability, initial CNS stimulation followed by depression, loss of coordination, dizziness, headache, weakness, pallor, flushing), respiration (breathlessness and chest constriction), cardiovascular system, (shallow/rapid pulse), and blood.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Benzene UNNA: 1114 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Benzene

California prop. 65 (no significant risk level): Benzene: 0.007 mg/day (value)

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Benzene

Connecticut carcinogen reporting list.: Benzene

Connecticut hazardous material survey.: Benzene

Illinois toxic substances disclosure to employee act: Benzene

Illinois chemical safety act: Benzene

New York release reporting list: Benzene

Rhode Island RTK hazardous substances: Benzene

Pennsylvania RTK: Benzene

Minnesota: Benzene

Michigan critical material: Benzene

Massachusetts RTK: Benzene

Massachusetts spill list: Benzene

New Jersey: Benzene

New Jersey spill list: Benzene

Louisiana spill reporting: Benzene

California Director's list of Hazardous Substances: Benzene

TSCA 8(b) inventory: Benzene
SARA 313 toxic chemical notification and release reporting: Benzene
CERCLA: Hazardous substances.: Benzene: 10 lbs. (4.536 kg)

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):

R11- Highly flammable.
R22- Harmful if swallowed.
R38- Irritating to skin.
R41- Risk of serious damage to eyes.
R45- May cause cancer.
R62- Possible risk of impaired fertility.
S2- Keep out of the reach of children.
S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S39- Wear eye/face protection.
S46- If swallowed, seek medical advice immediately and show this container or label.
S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves.
Lab coat.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

References: Not available.

Other Special Considerations: Not available.

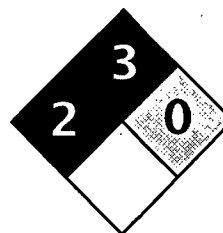
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Chemicals & Laboratory Equipment



Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet 1,2-Dichloroethane MSDS

Section 1: Chemical Product and Company Identification

Product Name: 1,2-Dichloroethane

Catalog Codes: SLD2521, SLD3721

CAS#: 107-06-2

RTECS: KH9800000

TSCA: TSCA 8(b) inventory: 1,2-Dichloroethane

CI#: Not available.

Synonym: Ethylene dichloride

Chemical Formula: C₂H₄CL₂

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: **1-800-901-7247**

International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:

1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{1,2-}Dichloroethane	107-06-2	100

Toxicological Data on Ingredients: 1,2-Dichloroethane: ORAL (LD50): Acute: 670 mg/kg [Rat]. 413 mg/kg [Mouse].
DERMAL (LD50): Acute: 2800 mg/kg [Rabbit]. VAPOR (LC50): Acute: 1414.2 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Extremely hazardous in case of ingestion. Very hazardous in case of eye contact (irritant), of inhalation. Hazardous in case of skin contact (irritant). Corrosive to skin and eyes on contact. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:

Very hazardous in case of ingestion, of inhalation.
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified 2B (Possible for human.) by IARC.
Classified 2 (Reasonably anticipated.) by NTP.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.

The substance is toxic to lungs, the nervous system, liver, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:

If the chemical got onto the clothed portion of the body, remove the contaminated clothes as quickly as possible, protecting your own hands and body. Place the victim under a deluge shower. If the chemical got on the victim's exposed skin, such as the hands : Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:

Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 413°C (775.4°F)

Flash Points: CLOSED CUP: 13°C (55.4°F). OPEN CUP: 18°C (64.4°F).

Flammable Limits: LOWER: 6.2% UPPER: 15.6%

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances:

Flammable in presence of open flames and sparks.
Slightly flammable to flammable in presence of oxidizing materials.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available.
Risks of explosion of the product in presence of static discharge: Not available.
Slightly explosive to explosive in presence of oxidizing materials.

Fire Fighting Media and Instructions:

Flammable liquid, soluble or dispersed in water.
SMALL FIRE: Use DRY chemical powder.
LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:

Flammable liquid. Corrosive liquid.

Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep locked up Keep container dry. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. Never add water to this product In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:

Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 10 CEIL: 75 (ppm) from ACGIH (TLV)

TWA: 40 CEIL: 300 (mg/m3) from ACGIH Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 98.96 g/mole

Color: Not available.

pH (1% soln/water): Not available.

Boiling Point: 83.5°C (182.3°F)

Melting Point: -35.3°C (-31.5°F)

Critical Temperature: Not available.

Specific Gravity: 1.2351 (Water = 1)

Vapor Pressure: 61 mm of Hg (@ 20°C)

Vapor Density: 3.42 (Air = 1)

Volatility: Not available.

Odor Threshold: 26 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; $\log(\text{oil/water}) = 0$

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, n-octanol, acetone.

Solubility:

Easily soluble in methanol, diethyl ether, n-octanol, acetone.

Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact. Inhalation. Ingestion.

Toxicity to Animals:

WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.

Acute oral toxicity (LD50): 413 mg/kg [Mouse].

Acute dermal toxicity (LD50): 2800 mg/kg [Rabbit].

Acute toxicity of the vapor (LC50): 1414.2 ppm 4 hour(s) [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified 2B (Possible for human.) by IARC.

Classified 2 (Reasonably anticipated.) by NTP.

The substance is toxic to lungs, the nervous system, liver, mucous membranes.

Other Toxic Effects on Humans:

Extremely hazardous in case of ingestion.

Very hazardous in case of inhalation.

Hazardous in case of skin contact (irritant).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in animal. Excreted in maternal milk in human.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Ethylene dichloride : UN1184 PG: II

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute:

1,2-Dichloroethane

California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: 1,2-Dichloroethane

Pennsylvania RTK: 1,2-Dichloroethane

Massachusetts RTK: 1,2-Dichloroethane
TSCA 8(b) inventory: 1,2-Dichloroethane
CERCLA: Hazardous substances.: 1,2-Dichloroethane

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
CLASS D-2A: Material causing other toxic effects (VERY TOXIC).
CLASS E: Corrosive liquid.

DSCL (EEC):

R11- Highly flammable.
R20/22- Harmful by inhalation and if swallowed.
R38- Irritating to skin.
R41- Risk of serious damage to eyes.
R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves.
Lab coat.
Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.
Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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MATERIAL SAFETY DATA SHEET

Diesel Fuels

VALERO MARKETING & SUPPLY COMPANY
and Affiliates
P.O. Box 696000
San Antonio, TX 78269-6000

Emergency Phone Numbers
24 Hour Emergency: 866-565-5220
Chemtrec Emergency: 800-424-9300

General Assistance
General Assistance: 210-345-4593

BRAND NAMES: Valero, Diamond Shamrock, Shamrock, Ultramar, Beacon, Total

Section 1. Chemical Product and Company Identification

Common / Trade name : Diesel Fuels
Synonym : Diesel Fuels All Grades, Diesel Fuel No.2, Fuel Oil No.2, High Sulfur Diesel Fuel, Low Sulfur Diesel Fuel, Ultra Low Sulfur Diesel Fuel, Off-Road Diesel fuel, Dyed Diesel Fuel, X Grade Diesel Fuel, X-1 Diesel Fuel

SYNONYMS/COMMON NAMES: This Material Safety Data Sheet applies to the listed products and synonym descriptions for Hazard Communication purposes only. Technical specifications vary greatly depending on the product and are not reflected in this document. Consult specification sheets for technical information. This product contains ingredients that are considered to be hazardous as defined by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Material uses : Motor fuels. Heating fuels.

MSDS # : 102

CAS # : 68476-34-6

Section 2. Composition, information on ingredients

<u>Name</u>	<u>CAS number</u>	<u>Concentration (%)</u>
Diesel fuel	68476-34-6	85 - 95
Naphthalene	91-20-3	1 - 3
n-Nonane	111-84-2	1 - 3
Hexane (Other Isomers)	mixture	1 - 3
n-Heptane	142-82-5	1 - 2
n-Hexane	110-54-3	1 - 2
Octane (All Isomers)	111-65-9	1 - 2

Section 3. Hazards Identification

Danger! Diesel Exhaust has been Reported to be an Occupational hazard due to NIOSH-reported potential carcinogenic properties.

Danger! Product May Contain or Release Hydrogen Sulfide. H₂S is a highly toxic, highly flammable gas which can be fatal if inhaled at certain concentrations.

May cause irritation to eyes, skin and respiratory system. Avoid liquid, mist and vapor contact. Harmful or fatal if swallowed. Aspiration hazard, can enter lungs and cause damage. May cause irritation or be harmful if inhaled or absorbed through the skin. Avoid prolonged or repeated skin contact. Combustible Liquid. Vapors may explode.

Physical state : Liquid. (May be dyed red.)

Continued on next page

Emergency overview	<p>: Danger!</p> <p>CAUSES EYE BURNS. HARMFUL IF SWALLOWED. CONTAINS MATERIAL WHICH CAUSES DAMAGE TO THE FOLLOWING ORGANS: BLOOD, KIDNEYS, LIVER, PERIPHERAL NERVOUS SYSTEM, RESPIRATORY TRACT, SKIN, CENTRAL NERVOUS SYSTEM, EYE, LENS OR CORNEA. SUSPECT CANCER HAZARD. CONTAINS MATERIAL WHICH MAY CAUSE CANCER. COMBUSTIBLE LIQUID AND VAPOR. VAPOR MAY CAUSE FIRE.</p> <p>Do not ingest. Do not get in eyes or on skin or clothing. Avoid breathing vapor or mist. Keep away from heat, sparks and flame. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Risk of cancer depends on duration and level of exposure.</p>
Routes of entry	: Dermal contact. Eye contact. Inhalation. Ingestion.
<u>Potential acute health effects</u>	
Eyes	: Corrosive to eyes. May cause severe irritation, redness, tearing, blurred vision and conjunctivitis.
Skin	: Prolonged or repeated contact may cause moderate irritation, defatting (cracking), redness, itching, inflammation, dermatitis and possible secondary infection. High pressure skin injections are SERIOUS MEDICAL EMERGENCIES . Injury may not appear serious at first. Within a few hours, tissues will become swollen, discolored and extremely painful.
Inhalation	: Nasal and respiratory tract irritation, central nervous system effects including excitation, euphoria, contracted eye pupils, dizziness, drowsiness, blurred vision, fatigue, nausea, headache, loss of reflexes, tremors, convulsions, seizures, loss of consciousness, coma, respiratory arrest and sudden death could occur as a result of long term and/or high concentration exposure to vapors. May also cause anemia and irregular heart rhythm. Repeated or prolonged exposure may cause behavioral changes. NIOSH Current Intelligence Bulletin 50 reports a potential occupational carcinogenic hazard exists due to human exposure to diesel exhaust.
Ingestion	: Toxic if swallowed. May cause burns to mouth, throat and stomach. This product may be harmful or fatal if swallowed. This product may cause nausea, vomiting, diarrhea and restlessness. DO NOT INDUCE VOMITING . Aspiration into the lungs can cause severe chemical pneumonitis or pulmonary edema/hemorrhage, which can be fatal. May cause gastrointestinal disturbances. Symptoms may include irritation, depression, vomiting and diarrhea. May cause harmful central nervous system effects, similar to those listed under "inhalation".
Medical conditions aggravated by over-exposure	: Repeated or prolonged contact with spray or mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray or mist may produce respiratory tract irritation, leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.
Over-exposure signs/symptoms	: Nasal and respiratory tract irritation, central nervous system effects including excitation, euphoria, contracted eye pupils, dizziness, drowsiness, blurred vision, fatigue, nausea, headache, loss of reflexes, tremors, convulsions, seizures, loss of consciousness, coma, respiratory arrest or sudden death could occur as a result of long term and/or high concentration exposure to vapors. May also cause anemia and irregular heart rhythm.
See toxicological information (section 11)	

Section 4. First Aid Measures

- Eye contact** : Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Seek medical advice if pain or redness continues.
- Skin contact** : In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention. Wash exposed area thoroughly with soap and water. Remove contaminated clothing promptly and launder before reuse. Contaminated leather goods should be discarded. If irritation persists or symptoms described in the MSDS develop, seek medical attention. High pressure skin injections are **SERIOUS MEDICAL EMERGENCIES**. Get immediate medical attention.
- Inhalation** : If inhaled, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.
- Ingestion** : This product may be harmful or fatal if swallowed. This product may cause nausea, vomiting, diarrhea and restlessness. **DO NOT INDUCE VOMITING**. Aspiration into the lungs can cause severe chemical pneumonitis or pulmonary edema/hemorrhage, which can be fatal. May cause gastrointestinal disturbances. Symptoms may include irritation, depression, vomiting and diarrhea. May cause harmful central nervous system effects, similar to those listed under "inhalation".
- Notes to physician** : In case of ingestion, gastric lavage with activated charcoal can be used promptly to prevent absorption. Consideration should be given to the use of an intratracheal tube, to prevent aspiration. Irregular heart beat may occur, use of adrenalin is not advisable. Individuals intoxicated by the product should be hospitalized immediately, with acute and continuing attention to neurological and cardiopulmonary function. Positive pressure ventilation may be necessary. After the initial episode, individuals should be monitored for changes in blood variables and the delayed appearance of pulmonary edema and chemical pneumonitis. Such patients should be monitored for several days or weeks for delayed effects, including bone marrow toxicity, hepatic and renal impairment. Individuals with chronic pulmonary disease will be more seriously impaired, and recovery from inhalation exposure may be complicated. In case of skin injection, prompt debridement of the wound is necessary to minimize necrosis and tissue loss.

Section 5. Fire Fighting Measures

- Flammability of the product** : Combustible.
- Auto-ignition temperature** : 257.2°C (495°F)
- Flash point** : Closed cup: 51.67 to 87.78°C (125 to 190°F).
- Flammable limits** : Lower: 0.4% Upper: 8%
- Products of combustion** : These products are carbon oxides (CO, CO₂), nitrogen and sulfur oxides (NO_x, SO_x), particulate matter, VOC's.
- Fire hazards in the presence of various substances** : Flammable in the presence of open flames, sparks and static discharge.
- Explosion hazards in the presence of various substances** : Explosive in the presence of open flames, sparks and static discharge.
- Fire-fighting media and instructions** : Combustible Liquid. Use dry chemical, foam or carbon dioxide to extinguish the fire. Consult foam manufacturer for appropriate media, application rates and water/foam ratio. Water can be used to cool fire- exposed containers, structures and to protect personnel. If a leak or spill has not ignited, ventilate area and use water spray to disperse gas or vapor and to protect personnel attempting to stop a leak. Use water to flush spills away from sources of ignition. Do not flush down public sewers.
- Collect contaminated fire-fighting water separately. It must not enter the sewage system. Dike area of fire to prevent runoff. Decontaminate emergency personnel and equipment with soap and water.

Combustible liquid and vapor. Vapor may cause flash fire. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.

- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.
- Special remarks on fire hazards** : No additional remark.
- Special remarks on explosion hazards** : No additional remark.

Section 6. Accidental Release Measures

- Personal precautions** : Immediately contact emergency personnel. Eliminate all ignition sources. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Do not touch or walk through spilled material. Tanks, vessels or other confined spaces which have contained product should be freed of vapors before entering. The container should be checked to ensure a safe atmosphere before entry. Empty containers may contain toxic, flammable/combustible or explosive residues or vapors. Do not cut, grind, drill, weld or reuse empty containers that contained this product. Do not transfer this product to another container unless the container receiving the product is labeled with proper DOT shipping name, hazard class and other information that describes the product and its hazards.
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. If facility or operation has an "oil or hazardous substance contingency plan", activate its procedures. Stay upwind and away from spill. Wear appropriate protective equipment including respiratory protection as conditions warrant. Do not enter or stay in area unless monitoring indicates that it is safe to do so. Isolate hazard area and restrict entry to emergency crew. Extremely flammable. Review Fire and Explosion Hazard Data before proceeding with clean up. Keep all sources of ignition (flames, smoking, flares, etc.) and hot surfaces away from release. Contain spill in smallest possible area. Recover as much product as possible (e.g., by vacuuming). Stop leak if it can be done without risk. Use water spray to disperse vapors. Spilled material may be absorbed by an appropriate absorbent, and then handled in accordance with environmental regulations. Prevent spilled material from entering sewers, storm drains, other unauthorized treatment or drainage systems and natural waterways. Contact fire authorities and appropriate federal, state and local agencies. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, contact the National Response Center at 800-424- 8802. For highway or railway spills, contact Chemtrec at 800-424-9300.
- Methods for cleaning up** : If emergency personnel are unavailable, contain spilled material. For small spills, add absorbent (soil may be used in the absence of other suitable materials) and use a non-sparking or explosion-proof means to transfer material to a sealable, appropriate container for disposal. For large spills, dike spilled material or otherwise contain it to ensure runoff does not reach a waterway. Place spilled material in an appropriate container for disposal.

Section 7. Handling and Storage

- Handling** : Do not ingest. Do not get in eyes, on skin or on clothing. Keep container closed. Use only with adequate ventilation. Avoid breathing vapor or mist. Keep away from heat, sparks and flame. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Wash thoroughly after handling. Use only in well ventilated locations. Keep away from heat, spark and flames. In case of fire, use water spray, foam, dry chemical or carbon dioxide as described in the Fire and Explosion Hazard Data section of the MSDS. Do not pressurize, cut, weld, braze, solder, drill on or near this container. "Empty" container contains residue (liquid and/or vapor) and may explode in heat of a fire.

Keep out of reach of children. Failure to use caution may cause serious injury or illness. Never siphon by mouth. For use as a motor fuel only. Do not use as a cleaning solvent or for other non-motor fuel uses. Wash thoroughly after handling. To prevent ingestion and exposure - Do not siphon by mouth to transfer product between containers. Use good personal hygiene practices. After handling this product, wash hands before eating, drinking, or using toilet facilities.

Storage

- : Store in tightly closed containers in cool, dry, isolated and well ventilated area away from heat, sources of ignition and incompatible materials. Use non-sparking tools and explosion proof equipment. Ground lines, containers, and other equipment used during product transfer to reduce the possibility of a static induced spark. Do not "switch load" because of possible accumulation of a static charge resulting in a source of ignition. Use good personal hygiene practices.

Section 8. Exposure controls, personal protection

Engineering controls

- : Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective occupational exposure limits. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection**Eyes**

- : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin

- : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Flame Retardant Clothing is recommended.

Respiratory

- : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands

- : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Personal protective equipment (Pictograms)

- : Consult your supervisor or S.O.P. for special handling direction.

**Personal protection in case of a large spill**

- : Splash goggles. Full suit. Vapor respirator. Boots. Gloves. Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product. Suggested protective clothing might not be adequate. Consult a specialist before handling this product.

Component

Diesel fuel

Naphthalene

n-Nonane

Exposure limits**ACGIH TLV (United States, 1/2004). Skin Notes: 2002 Adoption.**TWA: 100 mg/m³ 8 hour/hours. Form: Total hydrocarbons**NIOSH REL (United States, 6/2001).**

STEL: 15 ppm 15 minute/minutes. Form: All forms

TWA: 10 ppm 10 hour/hours. Form: All forms

OSHA PEL (United States, 6/1993).

TWA: 10 ppm 8 hour/hours. Form: All forms

ACGIH TLV (United States, 5/2004). Notes: 1996 Adoption Refers to Appendix A – Carcinogens.

STEL: 15 ppm 15 minute/minutes. Form: All forms

TWA: 10 ppm 8 hour/hours. Form: All forms

NIOSH REL (United States, 6/2001).

TWA: 200 ppm 10 hour/hours. Form: All forms

Hexane (Other Isomers)	ACGIH TLV (United States, 9/2004). TWA: 200 ppm 8 hour/hours. Form: All forms ACGIH TLV (United States, 9/2004). STEL: 1000 ppm 15 minute/minutes. Form: All forms TWA: 500 ppm 8 hour/hours. Form: All forms NIOSH REL (United States, 6/2001). CEIL: 510 ppm 15 minute/minutes. Form: All forms
n-Heptane	ACGIH TLV (United States, 9/2004). STEL: 500 ppm 15 minute/minutes. Form: All forms TWA: 400 ppm 8 hour/hours. Form: All forms NIOSH REL (United States, 6/2001). TWA: 350 mg/m ³ 10 hour/hours. Form: All forms OSHA PEL (United States, 6/1993). TWA: 500 ppm 8 hour/hours. Form: All forms OSHA PEL (United States, 6/1993). TWA: 500 ppm 8 hour/hours. Form: All forms ACGIH TLV (United States, 9/2004). Skin TWA: 50 ppm 8 hour/hours. Form: All forms NIOSH REL (United States, 6/2001). TWA: 50 ppm 10 hour/hours. Form: All forms
n-Hexane	NIOSH REL (United States, 6/2001). TWA: 50 ppm 10 hour/hours. Form: All forms NIOSH REL (United States, 6/2001). CEIL: 385 ppm 15 minute/minutes. Form: All forms TWA: 75 ppm 10 hour/hours. Form: All forms OSHA PEL (United States, 6/1993). TWA: 500 ppm 8 hour/hours. Form: All forms ACGIH TLV (United States, 3/2004). Notes: 1999 Adoption. TWA: 300 ppm 8 hour/hours. Form: All forms
Octane (All Isomers)	

Consult local authorities for acceptable exposure limits.

Section 9. Physical and Chemical Properties

Physical state	: Liquid. (May be dyed red.)
Color	: Clear. Straw.
Odor	: Kerosene (Strong.)
Boiling point	: 162.78 to 371.11°C (325 to 700°F)
Melting/freezing point	: May start to solidify at -51.15°C (-60.1°F) based on data for: n-Nonane. Weighted average: -92.6°C (-134.7°F)
Specific gravity	: 0.84 to 0.93 (Water = 1) (@ 60 °F)
Vapor pressure	: <0.7 kPa (<5.2 mm Hg) (at 20°C)
Vapor density	: 3 (Air = 1)
Volatility	: Negligible
Evaporation rate	: 0.02

Section 10. Stability and reactivity data

Stability and reactivity	: The product is stable.
Incompatibility with various substances	: Reactive with oxidizing agents, acids, alkalis.
Hazardous decomposition products	: These products are carbon oxides (CO, CO ₂), nitrogen and sulfur oxides (NO _x , SO _x), particulate matter, VOC's.
Hazardous polymerization	: Will not occur.

Section 11. Toxicological Information

Toxicity data

DIESEL EXHAUST FUMES have been reported to be a potential occupational carcinogen in humans by NIOSH Current Intelligence Bulletin 50.

HEPTANE can affect the body if it is inhaled, comes in contact with the eyes or skin, or is swallowed. Heptane vapor is a narcotic. Concentrations of 10,000 to 15,000 ppm produced narcosis in mice within 30 to 60 minutes, while 15,000 to 20,000 ppm caused convulsions and death. At 48,000 ppm, respiratory arrest was produced in mice in 3 to 4 minutes from the start of exposure. Human subjects exposed to 1,000 ppm for 6 minutes, or to 2,000 ppm for 4 minutes, reported slight vertigo. At 5,000 ppm for 4 minutes, there was marked vertigo, inability to walk a straight line, hilarity, and incoordination, but no complaints of eye and upper respiratory tract or mucous membrane irritation. A 15-minute exposure at 5,000 ppm produced in some subjects a state of stupor lasting for 30 minutes after exposure. These subjects also reported loss of appetite, slight nausea, and a taste resembling gasoline for several hours after exposure. Although chronic nervous system effects have not been attributed to heptane, polyneuritis has been reported following prolonged exposure to a petroleum fraction with boiling range between 70C and 100C, and this fraction would normally contain various isomers of heptane as major ingredients.

n-HEXANE can affect the body if it is inhaled, comes in contact with the eyes or skin, or is swallowed. Hexane vapor is a narcotic and a mild upper respiratory irritant. Polyneuropathy (peripheral nerve damage) has been reported to occur in workers exposed to hexane vapors, characterized by progressive weakness and numbness in the extremities, loss of deep tendon reflexes and reduction of motor nerve conduction velocity. Recovery ranges from no recovery to complete recovery depending upon the duration of exposure and severity of nerve damage. Concentrations of 30,000 ppm produced narcosis in mice within 30 to 60 minutes, convulsions and death occurred at 35,000 to 40,000 ppm, and at 64,000 ppm respiratory arrest was produced in 2.5 to 4.5 minutes from the start of exposure. Concentrations up to 8000 ppm produced no anesthesia. In human subjects, 2000 ppm for 10 minutes produced no effects, but 5000 ppm resulted in dizziness and a sensation of giddiness. Other investigators reported slight nausea, headache and irritation of the eyes and throat at 1400 to 1500 ppm. In industrial practice, mild narcotic symptoms such as dizziness have been observed when concentrations exceeded 1000 ppm, but not below 500 ppm.

NONANE causes a four hour LC50 in rats at concentrations of 3200 ppm, or at about the same level as VM&P Naphtha. This level is markedly lower than the lethal concentrations reported in earlier mice studies involving octane (13,500 ppm) and heptane (16,000 ppm), supporting the lower limit for nonane.

OCTANE can affect the body if it is inhaled, comes in contact with the skin or eyes or is swallowed. Octane vapor is a mild narcotic and mucous membrane irritant. Concentrations of 6600 to 13,700 ppm produced narcosis in mice in 30 to 90 minutes, the fatal concentration for animals is near 13,500 ppm. No chronic systemic effects have been reported in humans.

NAPHTHALENE can affect the body if it is inhaled, comes into contact with the eyes or the skin or if it is swallowed. Naphthalene vapor causes hemolysis and eye irritation, and may cause cataracts. Severe intoxication from ingestion of the solid results in characteristic manifestations of marked intravascular hemolysis and its consequences, including potentially fatal hyperkalemia. Initial symptoms include eye irritation, headache, confusion, excitement, malaise, profuse sweating, nausea, vomiting, abdominal pain, and irritation of the bladder. There may be progression to jaundice, hematuria, hemoglobinuria, renal tubular blockage, and acute renal shutdown. Hematologic features include red cell fragmentation, icterus, severe anemia with nucleated red cells, leukocytosis, and dramatic decreases in hemoglobin, hematocrit and red cell count; sometimes there is formation of Heinz bodies and methemoglobin. Individuals with a deficiency of glucose-6-phosphate dehydrogenase in erythrocytes may be more susceptible to hemolysis by naphthalene. Cataracts and ocular irritation have been produced experimentally in animals and have been described in humans. Of 21 workers exposed to high concentrations of fume or vapor for 5 years, 8 had peripheral lens opacities; in other studies, no abnormalities of the eyes have been detected in workers exposed to naphthalene for several years. The vapor causes eye irritation at 15 ppm. Eye contact with the solid may result in conjunctivitis, superficial injury to the cornea, chorioretinitis, scotoma, and diminished visual acuity. Naphthalene on the skin may cause hypersensitivity dermatitis, chronic dermatitis is rare.

HEXANE ISOMERS are three times as toxic to mice as is pentane. Narcosis was produced in mice within 30-60 minutes at concentrations of 30,000 ppm. In man, concentrations for 10 minutes at 2000 ppm produced no effects, but 5000 ppm caused dizziness and a sense of giddiness. Concentrations of 1400-1500 ppm produced slight nausea, headache, eye, and throat irritation.

<u>Ingredient name</u>	<u>Test</u>	<u>Result</u>	<u>Route</u>	<u>Species</u>
Naphthalene	LD50	490 mg/kg	Oral	Rat
	LD50	316 mg/kg	Oral	Mouse
	LD50	1200 mg/kg	Oral	Guinea pig
	LD50	>2500 mg/kg	Dermal	Rat
	LDLo	100 mg/kg	Oral	child
	LDLo	400 mg/kg	Oral	Dog

Chronic effects on humans : **CARCINOGENIC EFFECTS:** Classified A3 (Proven for animals.) by ACGIH, 3 (Possible for humans.) by European Union [Diesel fuel]. Classified 3 (Not classifiable for humans.) by IARC [Diesel fuel]. Classified 2B (Possible for humans.) by IARC [Naphthalene]. Classified A4 (Not classifiable for humans or animals.) by ACGIH [Naphthalene]. Contains material which causes damage to the following organs: blood, kidneys, liver, peripheral nervous system, upper respiratory tract, skin, central nervous system (CNS), eye, lens or cornea.

Other toxic effects on humans : Very hazardous in case of eye contact (corrosive).
Hazardous in case of skin contact (irritant), of ingestion, of inhalation (lung irritant).

Continued on next page

Special remarks on toxicity to animals : No additional remark.

Special remarks on chronic effects on humans : No additional remark.

Special remarks on other toxic effects on humans : No additional remark.

Specific effects

Carcinogenic effects : Contains material which may cause cancer. Risk of cancer depends on duration and level of exposure.

Target organs : Contains material which causes damage to the following organs: blood, kidneys, liver, peripheral nervous system, upper respiratory tract, skin, central nervous system (CNS), eye, lens or cornea.

Section 12. Ecological Information

Ecotoxicity data

<u>Ingredient name</u>	<u>Species</u>	<u>Period</u>	<u>Result</u>
Naphthalene	Daphnia magna (EC50)	48 hour/hours	1.6 mg/l
	Daphnia magna (EC50)	48 hour/hours	2.194 mg/l
	Daphnia magna (EC50)	48 hour/hours	2.55 mg/l
	Daphnia pulex (LC50)	96 hour/hours	1 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	1.6 mg/l
	Oncorhynchus mykiss (LC50)	96 hour/hours	1.8 mg/l
n-Hexane	Oncorhynchus mykiss (LC50)	96 hour/hours	1.8 mg/l
	Pimephales promelas (LC50)	96 hour/hours	2.5 mg/l

Products of degradation : These products are carbon oxides (CO, CO₂) and water.



Toxicity of the products of biodegradation : The products of degradation are less toxic than the product itself.

Section 13. Disposal Considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements.

Consult your local or regional authorities.

Section 14. Transport Information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1993	Diesel fuel	3 Combustible liquid.	III		Not available.
TDG Classification	UN1993	Diesel fuel Mixture	3	III		Not available.

Section 15. Regulatory Information

United States

U.S. Federal regulations : TSCA 4(a) final test rules: Hexane (Other Isomers); n-Hexane
 TSCA 8(a) PAIR: Naphthalene; n-Heptane; n-Nonane
 TSCA 8(b) inventory: Hexane (Other Isomers); Naphthalene; n-Heptane; n-Hexane; n-Nonane; Diesel fuel; Octane (All Isomers); Toluene; Benzene
 SARA 302/304/311/312 extremely hazardous substances: No products were found.
 SARA 302/304 emergency planning and notification: No products were found.
 SARA 302/304/311/312 hazardous chemicals: Hexane (Other Isomers); Naphthalene; n-Heptane; n-Hexane; n-Nonane; Octane (All Isomers)
 SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Hexane (Other Isomers): Fire hazard, Immediate (acute) health hazard; Naphthalene: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard; n-Heptane: Fire hazard; n-Hexane: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard; n-Nonane: Fire hazard, Immediate (acute) health hazard; Octane (All Isomers): Fire hazard
 Clean Water Act (CWA) 307: Naphthalene; Toluene; Benzene
 Clean Water Act (CWA) 311: Naphthalene; Toluene; Benzene
 Clean Air Act (CAA) 112 accidental release prevention: No products were found.
 Clean Air Act (CAA) 112 regulated flammable substances: No products were found.
 Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

SARA 313

	<u>Product name</u>	<u>CAS number</u>	<u>Concentration</u>
Form R - Reporting requirements	Naphthalene	91-20-3	1 - 3
	n-Hexane	110-54-3	1 - 2
Supplier notification	Naphthalene	91-20-3	1 - 3
	n-Hexane	110-54-3	1 - 2

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

State regulations : Connecticut carcinogen reporting list.: Benzene
 Connecticut hazardous material survey.: Naphthalene; n-Hexane; Toluene; Benzene
 Illinois toxic substances disclosure to employee act: Naphthalene; n-Hexane; Toluene; Benzene
 Rhode Island RTK hazardous substances: Naphthalene; n-Hexane; Toluene; Benzene
 Pennsylvania RTK: Hexane (Other Isomers): (generic environmental hazard); Naphthalene: (environmental hazard, generic environmental hazard); n-Heptane: (generic environmental hazard); n-Hexane: (generic environmental hazard); n-Nonane: (generic environmental hazard); Octane (All Isomers): (generic environmental hazard); Toluene: (environmental hazard, generic environmental hazard); Benzene: (special hazard, environmental hazard, generic environmental hazard)
 Florida: Naphthalene; n-Hexane; Toluene; Benzene
 Michigan critical material: Toluene; Benzene
 Massachusetts RTK: Hexane (Other Isomers); Naphthalene; n-Heptane; n-Hexane; n-Nonane; Octane (All Isomers); Toluene; Benzene
 New Jersey: Naphthalene; n-Heptane; n-Hexane; n-Nonane; Diesel fuel; Octane (All Isomers); Toluene; Benzene
WARNING: This product contains chemical/chemicals known to the state of California to cause cancer, birth defects or other reproductive harm.: Naphthalene; Toluene; Benzene
WARNING: This product contains chemical/chemicals known to the state of California to cause reproductive harm (male).: Benzene
 California prop. 65 (no significant risk level): Benzene
 California prop. 65 (Maximum Acceptable Dosage Level): Toluene; Benzene
WARNING: This product contains chemical/chemicals known to the state of California to cause birth defects or other reproductive harm.: Toluene; Benzene
WARNING: This product contains chemical/chemicals known to the state of California to

Continued on next page

cause cancer.: Naphthalene; Benzene

Canada

WHMIS (Canada)

- : Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
- Class D-1B: Material causing immediate and serious toxic effects (Toxic).
- Class D-2A: Material causing other toxic effects (Very toxic).
- Class D-2B: Material causing other toxic effects (Toxic).
- Class E: Corrosive liquid.
- CEPA DSL: Hexane (Other Isomers); Naphthalene; n-Heptane; n-Hexane; n-Nonane; Diesel fuel; Octane (All Isomers); Toluene; Benzene

Section 16. Other Information

Label requirements

- : CAUSES EYE BURNS.
- HARMFUL IF SWALLOWED.
- CONTAINS MATERIAL WHICH CAUSES DAMAGE TO THE FOLLOWING ORGANS: BLOOD, KIDNEYS, LIVER, PERIPHERAL NERVOUS SYSTEM, RESPIRATORY TRACT, SKIN, CENTRAL NERVOUS SYSTEM, EYE, LENS OR CORNEA.
- SUSPECT CANCER HAZARD.
- CONTAINS MATERIAL WHICH MAY CAUSE CANCER.
- COMBUSTIBLE LIQUID AND VAPOR.
- VAPOR MAY CAUSE FIRE.

Hazardous Material Information System (U.S.A.)

Health	0
Fire hazard	2
Physical Hazard	0
Personal protection	

National Fire Protection Association (U.S.A.)



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Definitions of Material Safety Data Sheet Terminology

GOVERNMENT AGENCIES AND PRIVATE ASSOCIATIONS

ACGIH - American Conference of Governmental Industrial Hygienists, (private association)

DOT - United States Department of Transportation

EPA - United States Environmental Protection Agency

IARC - International Agency for Research on Cancer, (private association)

NFPA - National Fire Protection Association, (private association)

MSHA - Mine Safety and Health Administration, U.S. Department of Labor

NIOSH - National Institute of Occupational Safety and Health, U.S. Department of Health and Human Services

NTP - National Toxicology Program, (private association)

OSHA - Occupational Safety and Health Administration, U.S. Department of Labor

WHMIS - Workplace Hazardous Material Information System

CSA - Canadian Standards Association

HAZARD AND EXPOSURE INFORMATION

Acute Hazard - An adverse health effect which occurs rapidly as a result of short term exposure.

CAS # - American Chemical Society's Chemical Abstract service registry number which identifies the product and/or ingredients.

Ceiling - The concentration that should not be exceeded during any part of the working exposure

Chronic Hazard - An adverse health effect which generally occurs as a result of long term exposure or short term exposure with delayed health effects and is of long duration

Fire Hazard - A material that poses a physical hazard by being flammable, combustible, pyrophoric or an oxidizer as defined by 29 CFR 1910.1200

Hazard Class - DOT hazard classification

Hazardous Ingredients - Names of ingredients which have been identified as health hazards

IDLH - Immediately Dangerous to Life and Health, the airborne concentration below which a person can escape without respiratory protection and exposure up to 30 minutes, and not suffer debilitating or irreversible health effects. Established by NIOSH.

mg/m3 - Milligrams of contaminant per cubic meter of air, a mass to volume ratio

N/A - Not available or no relevant information found

NA - Not applicable

PEL - OSHA permissible exposure limit; an action level of one half this value may be applicable

ppm - Part per million (one volume of vapor or gas in one million volumes of air)

Pressure Hazard - A material that poses a physical hazard due to the potential of a sudden release of pressure such as explosive or a compressed gas as defined by 29 CFR 1910.1200

Reactive Hazard - A material that poses a physical hazard due to the potential to become unstable reactive, water reactive or that is an organic peroxide as defined by 29 CFR 1910.1200.

STEL - The ACGIH Short-Term Exposure Limit, a 15-minute Time-Weighted Average exposure which should not be exceeded at any time during a workday, even if the 8-hour TWA is less than the TLV.

TLV - ACGIH Threshold Limit Value, represented herein as an 8-hour TWA concentration.

8-hour TWA - The time weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.

LD50 - Single dose of a substance that, when administered by a defined route in an animal assay, is expected to cause the death of 50% of the defined animal population.

LC50 - The concentration of a substance in air that, when administered by means of inhalation over a specified length of time in an animal assay, is expected to cause the death of 50% of a defined animal population.

MATERIAL SAFETY DATA SHEET: SIMPLE GREEN®

I. PRODUCT & COMPANY INFORMATION

PRODUCT NAME: SIMPLE GREEN® CLEANER / DEGREASER

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COMPANY NAME: SUNSHINE MAKERS, INC.

15922 Pacific Coast Highway
Huntington Harbour, CA 92649 USA
Telephone: 800-228-0709 • 562-795-6000
Fax: 562-592-3034
Website: www.simplegreen.com

Version No. 1006
Issue Date: March, 1999

For 24-hour emergency, call Chem-Tel, Inc.: 800-255-3924

USE OF PRODUCT: An all purpose cleaner and degreaser used undiluted or diluted in water for direct, spray, and dip tank procedures.

II. INGREDIENT INFORMATION

The only ingredient of Simple Green® with established exposure limits is undiluted 2-butoxyethanol (<6%) (Butyl Cellosolve; CAS No. 111-76-2); the OSHA PEL and ACGIH TLV is 25 ppm (skin). Note, however, that Butyl Cellosolve is only one of the raw material ingredients that undergo processing and dilution during the manufacture of Simple Green®. Upon completion of the manufacturing process, Simple Green® does not possess the occupational health risks associated with exposure to undiluted Butyl Cellosolve. Verification of this is contained in the independent test results detailed under "Toxicological Information" on Page 3 of this MSDS.

The Butyl Cellosolve in Simple Green® is part of a chemical category (glycol ethers) regulated by the Emergency Planning and Community Right-to-Know Act (SARA, Title III, section 313); therefore, a reporting requirement exists. Based upon chemical analysis, Simple Green® contains no known EPA priority pollutants, heavy metals, or chemicals listed under RCRA, CERCLA, or CWA. Analysis by TCLP (Toxicity Characteristic Leaching Procedure) according to RCRA revealed no toxic organic or inorganic constituents.

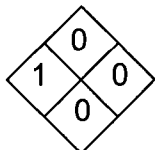
All components of Simple Green® are listed on the TSCA Chemical Substance Inventory.

III. HAZARDS IDENTIFICATION

UN Number: Not required
Dangerous Goods Class: Nonhazardous

Hazard Rating (NFPA/HMIS)

Health = 1* Reactivity = 0
Fire = 0 Special = 0



Rating Scale

0 = minimal 1 = slight
2 = moderate 3 = serious
4 = severe

*Mild eye irritant, non-mutagenic and non-carcinogenic. **None of the ingredients in Simple Green® are regulated or listed as potential cancer agents by Federal OSHA, NTP, or IARC.**

IV. FIRST AID MEASURES

SYMPTOMS OF OVEREXPOSURE AND FIRST AID TREATMENT

- Eye contact:** Reddening may develop. Immediately rinse the eye with large quantities of cool water; continue 10-15 minutes or until the material has been removed; be sure to remove contact lenses, if present, and to lift upper and lower lids during rinsing. Get medical attention if irritation persists.
- Skin contact:** Minimal effects, if any; rinse skin with water, rinse shoes and launder clothing before reuse. Reversible reddening may occur in some dermal-sensitive users; thoroughly rinse area and get medical attention if reaction persists.
- Swallowing:** Essentially non-toxic. Give several glasses of water to dilute; do not induce vomiting. If stomach upset occurs, consult physician.
- Inhalation:** Non-toxic. Exposures to concentrate-mist may cause mild irritation of nasal passages or throat; remove to fresh air. Get medical attention if irritation persists.

V. FIRE FIGHTING MEASURES

Simple Green® is stable, not flammable, and will not burn.

- | | |
|-----------------------------------|-------------------------------------------------------------|
| Flash Point/Auto-Ignition: | Not flammable. |
| Flammability Limits: | Not flammable. |
| Extinguishing Media: | Not flammable/nonexplosive. No special procedures required. |
| Special Fire Fighting Procedures: | None required. |

VI. ACCIDENTAL RELEASE MEASURES

Recover usable material by convenient method; residual may be removed by wipe or wet mop. If necessary, unrecoverable material may be washed to drain with large quantities of water.

VII. HANDLING, STORAGE & TRANSPORT INFORMATION

No special precautions are required. **This product is non-hazardous for storage and transport according to the U.S. Department of Transportation Regulations.** Simple Green® requires no special labeling or placarding to meet U.S. Department of Transportation requirements.

- | | |
|------------------------|--------------|
| UN Number: | Not required |
| Dangerous Goods Class: | Nonhazardous |

VIII. EXPOSURE CONTROLS

Exposure Limits: The Simple Green® formulation presents no health hazards to the user when used according to label directions for its intended purposes. Mild skin and eye irritation is possible (please see Eye contact and Skin contact in Section IV.).

Ventilation: No special ventilation is required during use.

Human Health Effects or Risks from Exposure: Adverse effects on human health are not expected from Simple Green®, based upon twenty years of use without reported adverse health incidence in diverse population groups, including extensive use by inmates of U.S. Federal prisons in cleaning operations.

Simple Green® is a mild eye irritant; mucous membranes may become irritated by concentrate-mist.

Simple Green® is not likely to irritate the skin in the majority of users. Repeated daily application to the skin without rinsing, or continuous contact of Simple Green® on the skin may lead to temporary, but reversible, irritation.

Medical Conditions Aggravated by Exposure: No aggravation of existing medical conditions is expected; dermal-sensitive users may react to dermal contact by Simple Green®.

IX. PERSONAL PROTECTION

Precautionary Measures:	No special requirements under normal use conditions.
Eye Protection:	Caution, including reasonable eye protection, should always be used to avoid eye contact where splashing may occur.
Skin Protection:	No special precautions required; rinse completely from skin after contact.
Respiratory Protection:	No special precautions required.
Work and Hygienic Practices:	No special requirements. Wash or rinse hands before touching eyes or contact lenses.

X. PHYSICAL AND CHEMICAL PROPERTIES

Appearance/odor:	Translucent green liquid with characteristic sassafras odor.		
Specific Gravity:	1.0257	Vapor Pressure:	17 mm Hg @ 20 °C; 22 mm Hg @ 25 °C
pH of concentrate:	9.5	Vapor Density:	1.3 (air = 1)
Evaporation:	>1 (butyl acetate = 1)	Density:	8.5 lbs./gallon
Boiling Point:	110 °C (231 °F)		
Freezing Point:	-9 °C (16 °F) If product freezes, it will reconstitute without loss of efficacy when brought back to room temperature and agitated.		

VOC Composite Partial Pressure: 0.006 mm Hg @ 20 °C

Volatile Organic Compounds (VOCs): 7.96 g/L per ASTM Method 3960-90. Per California AQMD's VOC test method, product must be diluted at least 2 parts of water to 1 part Simple Green® in order to meet SCAQMD Rule 1171 & Rule 1122 and BAAQMD Regulation 8-16 VOC requirements for solvent cleaning operations.

Water Solubility: Completely soluble in water. The higher salt concentrations in marine ecosystems will lead to complexes with Simple Green® that may become visible at ratios above one part Simple Green® to 99 parts seawater.

Ash Content: At 600 °F: 1.86% by weight.

Nutrient Content: Nitrogen: <1.0% by weight (fusion and qualitative test for ammonia).
Phosphorus: 0.3% by formula.
Sulfur: 0.6% by weight (barium chloride precipitation method).

Detection: Simple Green® has a characteristic sassafras odor that is not indicative of any hazardous situation.

XI. STABILITY AND REACTIVITY INFORMATION

Nonreactive. Simple Green® is stable, even under fire conditions, and will not react with water or oxidizers. Hazardous polymerization will not occur.

XII. TOXICOLOGICAL INFORMATION

Nonhuman Toxicity**Acute Mortality Studies:**

Oral LD₅₀ (rat): >5.0 g/kg body weight

Dermal LD₅₀ (rabbit): >2.0 g/kg body weight

Dermal Irritation: Only mild, but reversible, irritation was found in a standard 72-hr test on rabbits. A value of 0.2 (non-irritating) was found on a scale of 8.

Eye Irritation: With or without rinsing with water, the irritation scores in rabbits at 24 hours did not exceed 15 (mild irritant) on a scale of 110.

Subchronic dermal effects: No adverse effects, except reversible dermal irritation, were found in rabbits exposed to Simple Green® (up to 2.0 g/kg/day for 13 weeks) applied to the skin of 25 males and 25 females. Only female body weight gain was affected. Detailed microscopic examination of all major tissues showed no adverse changes.

Fertility Assessment by Continuous Breeding: The Simple Green® formulation had no adverse effect on fertility and reproduction in CD-1 mice with continuous administration for 18 weeks, and had no adverse effect on the reproductive performance of their offspring.

XIII. BIODEGRADABILITY AND ENVIRONMENTAL TOXICITY INFORMATION

Biodegradability:

Simple Green® is readily decomposed by naturally occurring microorganisms. The biological oxygen demand (BOD), as a percentage of the chemical oxygen demand (COD), after 4, 7, and 11 days was 56%, 60%, and 70%, respectively. Per OECD Closed Bottle Test, Simple Green® meets OECD and EPA recommendations for ready biodegradability.

In a standard biodegradation test with soils from three different countries, Butyl Cellosolve reached 50% degradation in 6 to 23 days, depending upon soil type, and exceeded the rate of degradation for glucose which was used as a control for comparison.

Environmental Toxicity Information:

Simple Green® is considered practically non-toxic per EPA's aquatic toxicity scale. Simple Green® is non-lethal to any of the marine and estuarine test animals listed in the following table at concentrations below 200 mg/L (0.02%). This table shows the Simple Green® concentrations that are likely to be lethal to 50% of the exposed organisms.

	<u>LC₅₀ in mg/L (ppm)</u>	
	<u>48-hour</u>	<u>96-hour</u>
<u>Marine Fish:</u>		
Mud minnow (<i>Fundulus heteroclitus</i>)	1690	1574
Whitebait (<i>Galaxias maculatus</i>)	210	210
<u>Marine/Estuarine Invertebrates:</u>		
Brine Shrimp (<i>Artemia salina</i>)	610	399
Grass Shrimp (<i>Palaemonetes pugio</i>)	270	220
Green-lipped Mussel (<i>Perna canaliculus</i>)	220	220
Mud Snail (<i>Potamopyrgus estuarinus</i>)	410	350

XIV. DISPOSAL CONSIDERATIONS

Simple Green® is fully water soluble and biodegradable and will not harm sewage-treatment microorganisms if disposal by sewer or drain is necessary. Dispose of in accordance with all applicable local, state, and federal laws.

XV. OTHER INFORMATION

- Containers: Simple Green® residues can be completely removed by rinsing with water; the container may be recycled or applied to other uses.
- Electrical Wiring Compatibility: Polyimide insulated wiring is not affected by exposure to Simple Green®. After immersion in Simple Green® for 14 days at 74°F, the 61 cm piece of polyimide insulated wire passed a one minute dielectric proof test at 2500 volts (ASTM D-149).
- Contact Point: Sunshine Makers, Inc., Research and Development Division: 562-795-6000.

***** NOTICE *****

All information appearing herein is based upon data obtained by the manufacturer and recognized technical sources. Judgments as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of this information, Sunshine Makers, Inc. or its distributors extends no warranties, makes no representations and assumes no responsibility as to the suitability of such information for application to purchaser's intended purposes or for consequences of its use.

Initial Preparation Date: 10/22/2004
Last Revision Date: None
Effective Date: 8/1/2005

MATERIAL SAFETY DATA SHEET

PRODUCT IDENTITY: PEAK® GLOBAL LIFETIME ANTIFREEZE & COOLANT

1. CHEMICAL PRODUCT & COMPANY INFORMATION

OLD WORLD INDUSTRIES, INC.
4065 COMMERCIAL AVENUE
NORTHBROOK, ILLINOIS 60062
PHONE: 847-559-2000
EMERGENCY PHONE: 1-800-424-9300 (CHEMTREC)

2. COMPOSITION/INFORMATION ON INGREDIENTS

<u>Material</u>	<u>CAS#</u>	<u>% by Wt</u>	<u>PEL (OSHA)</u>	<u>TLV (ACGIH)</u>
Ethylene Glycol	107-21-1	90 - 97	50 ppm	50 ppm
Diethylene Glycol	111-46-6	< 5	None	None
Hydrated inorganic acid, organic acid salts	proprietary	< 5	10 mg/m ³	1 mg/m ³
Water	7732-18-5	< 4	None	None

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Slight odor.

May be fatal if swallowed.

Vapors can cause eye irritation.

Lowest Known LD50 (Oral)
Lowest Known LD50 (Skin)

107-21-1
107-21-1

5840 mg/kg (Rats)
9530 mg/kg (Rabbits)

HAZARD RATING SYSTEM

NFPA: HEALTH: 1

FLAMMABILITY: 1

REACTIVITY: 0

HMIS: HEALTH: 2

FLAMMABILITY: 1

REACTIVITY: 0

KEY: 0 – Minimal 1 – Slight 2 - Moderate 3 - Serious 4 - Severe

POTENTIAL HEALTH EFFECTS

Routes of Exposure: Inhalation, Ingestion, Skin Contact/Absorption, Eye Contact

Eye: May cause slight transient (temporary) eye irritation. Corneal injury is unlikely. Vapors or mists may cause eye irritation.

Skin: Prolonged or repeated exposure not likely to cause significant skin irritation. A single prolonged exposure is not likely to result in the material being absorbed through skin in harmful amounts. Repeated skin exposure may result in absorption of harmful amounts. Massive contact with damaged skin or of material sufficiently hot to burn skin may result in absorption of potential lethal amounts.

Ingestion: Single dose oral toxicity is considered to be moderate. Excessive exposure may cause central nervous system effects, cardiopulmonary effects (metabolic acidosis), and kidney failure. Small amounts swallowed incidental to normal handling operations are not likely to cause injury; however, swallowing amounts larger than that may cause serious injury, even death.

Inhalation: At room temperature, exposures to vapors are minimal due to physical properties; higher temperatures may generate vapor levels sufficient to cause adverse effects.

Systemic (Other Target Organ) Effects: Repeated excessive exposures may cause severe kidney and also liver and gastrointestinal effects. Signs and symptoms of excessive exposure may be central nervous system effects. Signs and symptoms of excessive exposure may be nausea and/or vomiting. Signs and symptoms of excessive exposure may be anesthetic or narcotic effects. Observations in animals include formation of bladder stones after repeated oral doses of ethylene glycol. Reports of kidney failure and death in burn patients suggest the ethylene glycol may have been a factor. The use of topical applications containing this material may not be appropriate in severely burned patients or individuals with impaired renal function.

Cancer Information: Based on data from long-term animal studies, ethylene glycol is not believed to pose a carcinogenic risk to man.

Teratology (Birth Defects): Exposure to ethylene glycol has caused birth defects in laboratory animals only at doses toxic to the mother.

Reproductive Effects: Ethylene glycol has not interfered with reproduction in animal studies except at very high doses.

CHRONIC, PROLONGED OR REPEATED OVEREXPOSURE

Effects of Repeated Overexposure: Repeated inhalation of ethylene glycol mist may produce signs of central nervous system involvement, particularly dizziness and nystagmus.

Other Effects of Overexposure: repeated skin contact with ethylene glycol may, in a very small proportion of cases, cause sensitization with the development of allergic contact dermatitis. The incidence is significantly less than 1% with the undiluted material.

4. FIRST AID MEASURES

Ensure physician has access to this MSDS.

TREATMENT

Eyes: Immediately flush eyes with large amounts of water for 15 minutes, lifting lower and upper lids. Get medical attention as soon as possible. Contact lenses should never be worn when working with this chemical.

Skin: Flush area of skin contact immediately with large amounts of water for at least 15 minutes while removing contaminated clothing. If irritation persists after flushing, get medical attention promptly. Wash clothing before re-use.

Inhalation: If inhaled, immediately remove victim to fresh air and call ***emergency medical care***. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Ingestion: Obtain medical attention immediately. If patient is fully conscious, give two glasses of water. Do not induce vomiting. If medical advice is delayed, and if the person has swallowed a moderate volume of material (a few ounces), then give three to four ounces of hard liquor, such as whisky. For children, give proportionally less liquor, according to weight.

Notes to Physician:

It is estimated that the lethal oral dose to adults is of the order of 1.0 ml/kg. Ethylene glycol is metabolized by alcohol dehydrogenase to various metabolites including glyceraldehydes, glycolic acid and oxalic acid which cause an elevated anion-gap metabolic acidosis and renal tubular injury. The signs and symptoms in ethylene glycol poisoning are those of metabolic acidosis, CNS depression, and kidney injury. Urinalysis may show albuminuria, hematuria and oxaluria. Clinical chemistry may reveal anion-gap metabolic acidosis and uremia. The currently recommended medical management of ethylene glycol poisoning includes elimination of ethylene glycol and metabolites, correction of metabolic acidosis and prevention of kidney injury. It is essential to have immediate and follow up urinalysis and clinical chemistry. There should be particular emphasis on acid-base balance and renal function tests. A continuous infusion of 5% sodium bicarbonate with frequent monitoring of electrolytes and fluid balance is used to achieve correction of metabolic acidosis and forced diuresis. As a competitive substrate for alcohol dehydrogenase, ethanol is antidotal. Given in the early stages of intoxication, it blocks the formulation of nephrotoxic metabolites. A therapeutically effective blood concentration of ethanol is in the range 100-150 mg/dl, and should be achieved by a rapid loading dose and maintained by intravenous infusion. For severe and/or deteriorating cases, hemodialysis may be required. Dialysis should be considered for patients who are symptomatic, have severe metabolic acidosis, a blood ethylene glycol concentration greater than 25 mg/dl, or compromise of renal functions.

A more effective intravenous antidote for physician use is 4-methylpyrazole; a potent inhibitor of alcohol dehydrogenases, which effectively blocks the formation of toxic metabolites of ethylene glycol. It has been used to decrease the metabolic consequences of ethylene glycol poisoning before metabolic acidosis coma, seizures, and renal failure have occurred. A generally recommended protocol is a loading dose of 15 mg/kg followed by 10 mg/kg every 12 hours for 4 doses and then 15 mg/kg every 12 hours until ethylene glycol concentrations are below 20 mg/100 ml. Slow intravenous infusion is required. Since 4-methylpyrazole is dialyzable, increased dosage may be necessary during hemodialysis. Additional therapeutic measures may include the administration of cofactors involved in the metabolism of ethylene glycol. Thiamine (100 mg) and pyridoxine (50 mg) should be given every six hours.

Pulmonary edema with hypoxemia has been described in a number of patients following poisoning with ethylene glycol. The mechanism of production has not been elucidated, but it appears to be non-cardiogenic in origin in several cases. Respiratory support with mechanical ventilation and positive end expiratory pressure may be required. There may be cranial nerve involvement in the late stages of toxicity from swallowed ethylene glycol. In particular, effects have been reported involving the seventh, eighth and ninth cranial nerves, presenting with bilateral facial paralysis, diminished hearing and dysphasia.

5. FIRE FIGHTING MEASURES

Flammable Properties

Flash Point: 119°C (247°F)

Method Used: Setaflash

Autoignition Temperature: Autoignition temperature for ethylene glycol is 398°C (748°F).

Flammability Limits - % of vapor concentration at which product can ignite in presence of spark.

Lower Flammability Limit: 3.2%

Upper Flammability Limit: 15.3%

Hazardous Combustion Products: Hazardous combustion products may include and are not limited to carbon monoxide, carbon dioxide and trace amounts of aldehydes and organic acids. When available oxygen is limited, as in a fire or when heated to very high temperatures by a hot wire or plate, carbon monoxide and other hazardous compounds such as aldehydes might be generated.

Extinguishing Media: Water fog or fine spray. Alcohol resistant foams (ATC type) are preferred if available. General purpose synthetic foams (including AFFF) or protein foams may function, but much less effectively. Carbon dioxide. Dry chemical. Do not use direct water stream. May spread fire.

Fire Fighting Instructions: No fire and explosion hazards expected under normal storage and handling conditions (i.e. ambient temperatures). However, ethylene glycol or solutions of ethylene glycol and water can form flammable vapors with air if heated sufficiently. Keep people away. Isolate fire area and deny unnecessary entry.

Protective Equipment for Fire Fighters: Wear positive-pressure, self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire-fighting helmet, coat, pants, boots and gloves).

6. ACCIDENTAL RELEASE MEASURES

Protect People: Material is moderately toxic when ingested. Take adequate precautions to keep people, especially children away from spill site. PVC-coated rubber gloves and monogoggles or face shield can be used during cleanup of spill site. Product on surfaces can cause slippery conditions. Practice reasonable care and cleanliness. Avoid breathing spray mists if generated. Keep out of reach of children. Product may become a solid at temperatures below -18°C (0°F). Do not store near food, foodstuffs, drugs or potable water supplies.

Protect the Environment: Do not dump used product or diluted material into sewers, on the ground, or into any body of water.

Cleanup: Small spills: Soak up with absorbent material. Large spills: Dike and pump into suitable containers for disposal. Ensure compliance with all applicable statutes that require notification of appropriate government officials.

7. HANDLING AND STORAGE

Steps to be Taken in Case Material is Released or Spilled: Eliminate all sources of ignition in vicinity of the spilled or released fluid.

Other Precautions: Use normal precautions in handling any combustible liquid. Keep container closed when not in use. Store away from heat or open flame. Product on surfaces can cause slippery conditions. Practice reasonable care and cleanliness. Avoid breathing spray mists if generated. Keep out of reach of children. Product may become a solid at temperatures below -18°C (0°F). Do not store near food, foodstuffs, drugs or potable water supplies.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Respiratory Protection: Respiratory protection is required if airborne concentration exceeds TLV. At any detectable concentration any self-contained breathing apparatus with a full face piece and operated in a pressure-demand or other positive pressure mode or any supplied-air respirator with a full face piece and operated in a pressure-demand or other positive pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.

Escape: Any air-purifying full face piece respirator (gas mask) with a chin-style or front- or back-mounted organic vapor canister or any appropriate escape-type self-contained breathing apparatus.

Skin Protection: Protective gloves recommended when prolonged skin contact cannot be avoided. Polyethylene; Neoprene; Nitrile; Polyvinyl alcohol; Natural Rubber, Butyl Rubber. Safety shower should be available.

Eye Protection: Safety goggles and face shield. Emergency eyewash should be available. Contact lenses should not be worn when working with this chemical.

Engineering Controls: Use general or local exhaust ventilation to meet TLV requirements.

EXPOSURE LIMITS

<u>Component</u>	<u>Exposure Limits</u>	<u>Skin Form</u>
Ethylene glycol	100 mg/m3 CEILING ACGIH	Aerosol
Ethylene glycol	125 mg/m3 CEILING OSHA-vacated	
	50 ppm CEILING OSHA – vacated	
	100 mg/m3 CEILING UCC	
Diethylene glycol	50 ppm TWA8 AIHA WEEL	Aerosol and Vapor
Diethylene glycol	10 mg/m3 TWA8 AIHA WEEL	Aerosol and Vapor
		Aerosol

In the Exposure Limits Chart above, if there is no specific qualifier (i.e., Aerosol) listed in the Form Column for a particular limit, the listed limit includes all airborne forms of the substance that can be inhaled.

A “blank” in the Skin column indicates that exposure by the cutaneous (skin) route is not a potential significant contributor to overall exposure.

9. PHYSICAL / CHEMICAL PROPERTIES

Boiling Point:	176°C (349°F)
Freeze Point:	-15°C (5°F)
Specific Gravity (Water =1):	1.12
Pounds/gallon	9.3
Vapor Pressure (mm of Hg) @ 20C:	<0.1
Vapor Density (air=1):	Not established
Water Solubility:	Complete
Evaporation Rate (BuAc = 1):	Nil
% Volatile By Volume:	90-97
Appearance:	Amber
Odor:	Mild
pH (50% Water Solution):	8.0

10. STABILITY & REACTIVITY DATA

Stability:	Stable
Conditions to Avoid:	Keep away from flame
Incompatibility (Materials to Avoid):	Strong acid or oxidizing agents
Hazardous Decomposition Products:	Incomplete combustion may produce CO gas
Hazardous Polymerization:	Will not occur

11. TOXICOLOGICAL INFORMATION

Skin: The dermal LD50 has not been determined.

Ingestion: The lethal dose in humans is estimated to be 100 ml (3 ozs.). The oral LD50 for rats is in the 6000-13,000-mg/kg range.

Hydrated Inorganic Acid Sodium Salt: The lowest dose of a similar compound reported to produce death in humans was estimated to be 709 mg/kg body weight for a person weighing 150 pounds, this would be equivalent to swallowing about one-tenth (.1) of a pound of the dry material in a short period of time.

Acute oral LD50s for a similar compound = 2,650 mg/kg (rats) 2,000 mg/kg (mice)

Mutagenicity (The Effects on Genetic Material): In vitro mutagenicity studies were negative. Animal mutagenicity studies were negative.

Significant Data with Possible Relevance to Humans: Ethylene glycol has been shown to produce dose-related teratogenic effects in rats and mice when given by gavage or in drinking water at high concentrations or doses. The no-effect doses for developmental toxicity for ethylene glycol given by gavage over the period of organogenesis has been shown to be 150 mg/kg/day for the mouse and 500 mg/kg/day for the rat. Also, in a preliminary study to assess the effects of exposure of pregnant rats and made to aerosol at concentrations of 150, 1000 and 25000 mg/m3 for 6 hours a day throughout the period of organogenesis, teratogenic effects were produced at the highest concentration, but only in mice. The conditions of these latter experiments did not allow a conclusion as to whether the developmental toxicity was mediated by inhalation of aerosol percutaneous absorption of ethylene glycol from contaminated skin, or swallowing ethylene glycol as a result of grooming the wetted coat. In a further study, comparing effects from high aerosol concentration by whole-body or nose-only exposure, it was shown that nose-only exposure resulted in maternal toxicity (1000 and 25000 mg/m3) and developmental toxicity with minimal

evidence of teratogenicity (2500 mg/m³). The no-effects concentration (based on maternal toxicity) was 500 mg/m³. In a further study in mice, no teratogenic effects could be produced when ethylene glycol was applied to skin of pregnant mice over the period of organogenesis. The above observations suggest that ethylene glycol is to be regarded as an animal teratogen. There is currently no available information to suggest that ethylene glycol has caused birth defects in humans. Cutaneous application of ethylene glycol is ineffective in producing developmental toxicity. Exposure to high aerosol concentrations is only minimally effective in producing developmental toxicity. The major route for producing developmental toxicity is perorally. Two chronic feeding studies, using rats and mice, have not produced any evidence that ethylene glycol causes dose-related increases in tumor incidence or a different pattern of tumors compared with untreated controls. The absence of carcinogenic potential for ethylene glycol has been supported by numerous in vitro genotoxicity studies showing that it does not produce mutagenic or clastogenic effects.

A chronic dietary feeding study of diethylene glycol with rats showed mild kidney injury at 1%, while concentrations of 2% and 4% caused more marked kidney injury. In addition, at 2% and 4% of diethylene glycol in the diet, some rats developed benign papillary tumors in the urinary bladder. These have been attributed to the presence of urinary bladder calcium oxalate stones. No evidence for carcinogenicity was found with a chronic skin-painting study with diethylene glycol in mice. The absence of a direct chemical carcinogenic effect addords with the results in vitro genotoxicity studies that show that it does not produce mutagenic or clastogenic effects. A feeding study employing up to 5.0% diethylene glycol in the diet failed to produce any teratogenic effects. In a mouse continuous breeding study with large doses of diethylene glycol in drinking water, there was evidence for reproductive toxicity at 3.5% (equivalent to 6.1 g/kg/day) as reduced number of litter, live pups per litter and live pup weight. No such effects were seen at 1.75% (approximately 3.05 g/kg/day). The relevance of these very high dosages to human health is uncertain. Pregnant rats receiving undiluted diethylene glycol by gavage over the period of organogenesis had toxic effects at 4.0 and 8.0 ml/kg/day as mortality, decreased body weight, decreased food consumption increased water consumption and increased liver and kidney weights. Fetotoxicity was seen only at these maternally toxic dosages. Decreased fetal body weight occurred at 8.0 ml/kg/day, and increased skeletal variants at 4.0 and 8.0 ml/kg/day. No embryotoxic or teratogenic effects were seen. Neither maternal toxicity nor fetotoxicity occurred at 1.0 ml/kg/day. In a study with mice also receiving undiluted diethylene glycol over the period of organogenesis, maternal toxicity occurred at 2.5 and 10.0 ml/kg/day, but not at 0.5 ml/kg/day. Definitive developmental toxicity was not seen in this species.

ACUTE TOXICITY

Peroral: The lethal dose in humans is estimated to be 3 oz. or 100 ml.

Rat: LD₅₀ (6000 – 13000) mg/kg

Percutaneous:

Rabbit: LD₅₀ = >22270 mg/kg; 24 h occluded

Inhalation:

Rat: 8-hour exposure, substantially saturated vapor studies, dynamic generation method

Mortality: 0/6

Inhalation: Mist/vapor study, rat, at 170°C, 8-hour exposure = 2.2 mg/l

Mortality: 0/6

Inhalation:

Rat: 8-hour exposure, fog = 10000 ppm; 65° - 70°C

Mortality: 0/6

IRRITATION

Skin:

Rabbit: 24-hour occluded contact, 0.5 ml
Results: Minor erythema and edema

Skin:

Human: Primary irritation patch test, 48-hour occluded, 0.2 ml
Results: Evidence of irritation

Eye:

Rabbit: 0.1 ml
Results: Minor transient iritis, conjunctival irritation with discharge

REPEATED EXPOSURE

In a 7-day dietary study with rats, a significant increase in kidney weights in females was observed at 5.0 gm/kg. The NOEL was 2.5 gm/kg.

In a 24-month dietary study with rats, increased mortality in males was observed at the highest dose, 1.0 gm/kg/day. There were multiple signs: mineralization of several organs, including the cardiac vessels, cardiac muscle, vas deferens, stomach and pulmonary vessels; cellular hyperplasia of the parathyroids, hemosiderosis of the spleen, myocardial fibrosis, portal fibrosis of the liver, bile duct hyperplasia and hydronephrosis and oxylate nephrosis of the kidneys. Ethylene glycol was not oncogenic.

In a 90-day dietary study with dogs, repeated exposures to 2.5 gm/kg resulted in acute renal failure and deaths. The NOAEL was 1.0 gm/kg.

SENSITIZATION (ANIMAL AND HUMAN STUDIES)

Repeated skin contact with ethylene glycol may, in a very small proportion of cases, cause sensitization with the development of allergic contact dermatitis. The incidence is significantly less than 1% with the undiluted material.

REPRODUCTIVE TOXICITY

A three-generation study indicated that ethylene glycol did not affect reproductive parameters at dietary concentrations up to 1.0 gm/kg/day in any generation.

CHRONIC TOXICITY AND CARCINOGENICITY

Two chronic feeding studies, using rats and mice, have not produced any evidence that ethylene glycol causes dose-related increases in tumor incidence or a different pattern of tumors compared with untreated controls. The absence of a carcinogenic potential for ethylene glycol has been supported by numerous in vitro genotoxicity studies showing that it does not produce mutagenic or clastogenic effects.

GENETIC TOXICOLOGY

In Vitro: Ethylene glycol was devoid of genotoxic activity in an Ames test, forward gene mutation and sister chromatid exchange (SCE) studies in Chinese Hamster Ovary (CHO) cells and an in vitro cytogenetics study.

In Vivo: Ethylene glycol by three different routes (intravenous, peroral and percutaneous) demonstrates apparent first-order pharmacokinetic behavior for the disposition in and the elimination from the plasma. Dose-dependent changes occur for the elimination of metabolites in the urine and as $^{14}\text{CO}_2$ after single doses for the intravenous and peroral, but not the percutaneous route. The hypothesis from literature sources exists that developmental toxicity is

caused by a metabolite of ethylene glycol, called glycolic acid, and not parent ethylene glycol. Under most conditions of ethylene glycol exposure, the glycolic acid metabolite is present in the blood in very low levels. However, it can become the major metabolite following large doses of ethylene glycol due to saturation of glycolic acid oxidation and/or elimination. When levels of this acidic metabolite exceed the capacity of maternal blood buffers to neutralize it, a maternal metabolic acidosis ensues, which has been hypothesized to be the true agent responsible for ethylene glycol induced developmental toxicity. Research suggests that ethylene glycol developmental toxicity is due to a dose-rate dependent toxicokinetic shift leading to glycolate accumulation and metabolic acidosis.

ADDITIONAL STUDIES

Ethylene glycol has been shown to produce dose-related teratogenic effects in rats and mice when given by gavage or in drinking water at high concentrations or doses. The no-effect doses for developmental toxicity for ethylene glycol given by gavage over the period of organogenesis has been shown to be 150 mg/kg/day for the mouse and 500 mg/kg/day for the rat. Also, in a preliminary study to assess the effects of exposure of pregnant rats and mice to aerosols at concentrations of 150, 1000 and 2500 mg/m³ for 6 hours a day throughout the period of organogenesis, teratogenic effects were produced at the highest concentration, but only in mice. The conditions of these latter experiments did not allow a conclusion as to whether the developmental toxicity was mediated by inhalation of aerosol, percutaneous absorption of ethylene glycol from contaminated skin, or swallowing of ethylene glycol as a result of grooming the wetted coat. In a further study, comparing effects from high aerosol concentration by whole-body or nose-only exposure, it was shown that nose-only exposure resulted in maternal toxicity (1000 and 2500 mg/m³) and developmental toxicity with minimal evidence of teratogenicity (2500 mg/m³). The no-effects concentration (based on maternal toxicity) was 500 mg/m³. In a further study in mice, no teratogenic effects could be produced when ethylene glycol was applied to the skin of pregnant mice over the period of organogenesis. The above observations suggest that ethylene glycol is to be regarded as an animal teratogen. There is currently no available information to suggest that ethylene glycol has caused birth defects in humans. Cutaneous application of ethylene glycol is ineffective in producing developmental toxicity. Exposure to high aerosol concentrations is only minimally effective in producing developmental toxicity.

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL FATE

Movement & Partitioning: Bioconcentration potential is low (BCF less than 100 or Log Kow less than 3). Log octanol/water partition coefficient (log Kow) is -1.36. Henry's Law Constant (H) is 6.0E-08 atm-m³/mol. Bioconcentration factor (BCF) is 10 in golden orfe.

Degradation & Transformation: Biodegradation under aerobic static laboratory conditions is high (BOD₂₀ or BOD₂₈/ThOD greater than 40%). 5-Day biochemical oxygen demand (BOD₅) is 0.78 p/p. 10-Day biochemical oxygen demand (BOD₁₀) is 1.06 p/p. 20-Day biochemical oxygen demand (BOD₂₀) is 1.15 p/p. Theoretical oxygen demand (ThOD) is calculated to be 1.29 p/p. Biodegradation may occur under both aerobic and anaerobic conditions (in either the presence or absence of oxygen). Inhibitory concentration (IC₅₀) in OECD "Activated Sludge, Respiration Inhibition Test" (Guideline # 209) is < 1000 mg/L. Degradation is expected in the atmospheric environment within days to weeks.

Ecotoxicology: Material is practically non-toxic to aquatic organisms on an acute basis (LC₅₀ greater than 100 mg/L in most sensitive species). Acute LC₅₀ for fathead minnow (*Pimephales promelas*) is 51000 mg/L. Acute LC₅₀ for bluegill (*Lepomis macrochirus*) is 27549 mg/L. Acute LC₅₀ for rainbow trout (*Oncorhynchus mykiss*) is about 18000-46000 mg/L. Acute LC₅₀ for guppy (*Poecilia reticulata*) is 49300 mg/L. Acute LC₅₀ for water flea (*Daphnia magna*) is 46300-51100 mg/L. Acute LC₅₀ for the cladoceran *Ceriodaphnia dubia* is 10000-25800 mg/L. Acute LC₅₀ for crayfish is 91430 mg/L. Acute LC₅₀ for brine shrimp (*Artemia salina*) is 20000 mg/L. Acute

LC50 for golden orfe (*Leuciscus idus*) is greater than 10000 mg/L. Acute LC50 for goldfish (*Carassius auratus*) is greater than 5000 mg/L. Growth inhibition EC50 for green alga *Selenastrum capricornutum* is 9500-13000 mg/L.

BOD (% Oxygen Consumption):

Day 5	Day 10	Day 15	Day 20	Day 30
51%	80%		97%	

ECOTOXICITY

Toxicity to Micro-organisms:

Bacterial / NA: 16 h; IC50

Result Value: >10000 mg/l

Toxicity to Aquatic Invertebrates:

Daphnia: 48 h; LC50

Result Value: >100000 mg/l

Toxicity to Fish

Fathead Minnow: 94 h; LC50

Result Value: 70000 mg/l

FURTHER INFORMATION

Chemical Oxygen Demand (COD) – Measured: 1.29 mg/mg

Theoretical Oxygen Demand (THOD) – Calculated: 1.30 mg/mg

Octanol/Water Partition Coefficient – Measured: -1.36

13. DISPOSAL CONSIDERATIONS

DO NOT discharge to sewer. Wear appropriate personal protection. Take up with sand, vermiculite, or similar inert material. Dispose in accordance with federal, state and local regulations.

14. TRANSPORT INFORMATION

U.S. DEPARTMENT OF TRANSPORTATION

Non-Bulk

Not regulated by the US D.O.T. (in quantities under 5,000 lbs in any one inner package)

Bulk

Proper Shipping Name: Environmentally Hazardous Substance, LIQUID N.O.S. (ETHYLENE GLYCOL)

Technical Name: ETHYLENE GLYCOL

ID Number: UN 3082

Hazard Class: 9

Packing Group: PG III

Reportable Quantity: 5,000 lb.

IATA
Non-Bulk
Not Regulated by IATA

IMDG
Non-Bulk
Not regulated by IMDG (in quantities under 5,000 lbs in any one inner package)

15. REGULATORY INFORMATION

THIS PRODUCT CONTAINS COMPONENT(S) CITED ON THE FOLLOWING REGULATIONS.

<u>Chemical Name</u>	<u>Cas Number</u>
Ethylene Glycol	107-21-1

United States - TSCA

Inventory: Listed

Water Standards: No data available

Atmospheric Standards: Clean Air Act (1990) - List of Hazardous Air Contaminants: listed

CERCLA: Reportable Quantity (RQ): 5,000 pounds (532 gallons)

**OSHA Hazard Communication
Standard:**

This product is a "hazardous chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SARA Title III:

Section 311/312 - Categories: Acute hazard; chronic hazard

Section 312 - Inventory Reporting: Ethylene glycol is subject to Tier I and/or Tier II annual inventory reporting.

Section 313 - Emission Reporting: Ethylene glycol is subject to Form R reporting requirements.

Section 302 - Extremely Hazardous Substances: Ethylene glycol is not listed.

State Right-To-Know:

California - Exposure Limits - Ceilings:	vapor-50 ppm ceiling; 125 mg/m3 ceiling
Director's List of Hazardous Substances:	listed
Florida - Hazardous Substances List:	listed
Massachusetts - Right-to-Know List:	listed
Minnesota - Haz. Subs. List:	listed (particulate and vapor)
New Jersey - Right-to-Know List (Total):	Present greater than 1.0%
Pennsylvania Right-to-Know List:	environmental hazard

Canadian Regulations: This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required.

WHMIS Information: D2A - material has potential toxic effects. Refer elsewhere in the MSDS for specific warnings and safe handling information. Refer to the employer's workplace education program.

California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986): The normal consumer use of this product does not result in exposure to chemicals known to the state of California to cause Cancer and/or reproductive harm above the significant risk level for carcinogens or the maximum allowable dose levels for reproductive toxins. Warnings are not required for consumer packaging. However, industrial or other occupational use of this product at higher frequency and using larger quantities of this product may result in exposures exceeding these levels and are labeled accordingly.

California SCAQMD Rule 443.1 (South Coast Air Quality Management District Rule 443.1, Labeling of Materials Containing Organic Solvents):

VOC: Vapor pressure 0.06 mmHg at 20°C
1113.38 g/l

16. OTHER INFORMATION

Contact: Thomas Cholke

Phone: (847) 559-2225

Old World Industries, Inc. makes no warranty, representation or guarantee as to the accuracy, sufficiency or completeness of the material set forth herein. It is the user's responsibility to determine the safety, toxicity and suitability of his own use, handling and disposal of this product. Since actual use by others is beyond our control, no warranty, expressed or implied, is made by Old World Industries, Inc. as to the effects of such use, the results to be obtained or the safety and toxicity of this product, nor does Old World Industries, Inc. assume liability arising out of the use by others of this product referred to herein. The data in this MSDS relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.



MATERIAL SAFETY DATA SHEET

Unleaded Gasoline

VALERO MARKETING & SUPPLY COMPANY
and Affiliates

P.O. Box 696000
San Antonio, TX 78269-6000

Emergency Phone Numbers
24 Hour Emergency: 866-565-5220
Chemtrec Emergency: 800-424-9300

General Assistance
General Assistance: 210-345-4593

BRAND NAMES: Valero, Diamond Shamrock, Shamrock, Ultramar, Beacon, Total

Section 1. Chemical Product and Company Identification

Common / Trade name : Unleaded Gasoline
Synonym : Regular/Premium/Midgrade - Unleaded Gasoline, Petrol, Motor Fuel, Reformulated Gasoline, RFG, Conventional, Oxygenated, Non-Oxygenated, CARB Gasoline

SYNONYMS/COMMON NAMES: This Material Safety Data Sheet applies to the listed products and synonym descriptions for Hazard Communication purposes only. Technical specifications vary greatly depending on the product and are not reflected in this document. Consult specification sheets for technical information. This product contains ingredients that are considered to be hazardous as defined by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Material uses : Motor fuels.
MSDS# : 002
CAS # : 86290-81-5

Section 2. Composition, Information on Ingredients

<u>Name</u>	<u>CAS number</u>	<u>Concentration (%)</u>
Gasoline	86290-81-5	0 - 100
Hexane (Other Isomers)	mixture	5 - 25
Toluene	108-88-3	0 - 30
Xylene (o,m,p isomers)	1330-20-7	0 - 25
Octane (All Isomers)	111-65-9	0 - 18.5
Methyl Tertiary Butyl Ether (MTBE)	1634-04-4	0 - 16
Ethanol	64-17-5	0 - 10
1,2,4-Trimethylbenzene	95-63-6	0 - 6
n-Heptane	142-82-5	1 - 5
Pentane	109-66-0	1 - 5
Tertiary Amyl Methyl Ether (TAME)	994-05-8	0 - 6
Ethylbenzene	100-41-4	0 - 5
Cumene	98-82-8	0 - 5
Benzene	71-43-2	0 - 4.9
Cyclohexane	110-82-7	0 - 3
n-Hexane	110-54-3	0 - 3

Continued on next page

Section 3. Hazards Identification

Danger! Contains Benzene. Cancer Hazard. Can cause kidney, liver and blood disorders. May cause irritation to eyes, skin and respiratory system. Avoid liquid, mist and vapor contact. Harmful or fatal if swallowed. Aspiration hazard; can enter lungs and cause damage. May cause irritation or be harmful if inhaled or absorbed through the skin. Extremely flammable liquid. Vapors may explode.

Physical state : Liquid.

Emergency overview : Warning!

CANCER HAZARD

CONTAINS MATERIAL WHICH CAN CAUSE CANCER

HIGHLY FLAMMABLE LIQUID AND VAPOR.

HARMFUL IF SWALLOWED.

CONTAINS MATERIAL WHICH CAUSES DAMAGE TO THE FOLLOWING ORGANS:
BLOOD, KIDNEYS, LUNGS, REPRODUCTIVE SYSTEM, LIVER, PERIPHERAL
NERVOUS SYSTEM, GASTROINTESTINAL TRACT, RESPIRATORY TRACT, SKIN,
BONE MARROW, CENTRAL NERVOUS SYSTEM, EYE, LENS OR CORNEA.

VAPOR MAY CAUSE FLASH FIRE.

MAY BE HARMFUL IF ABSORBED THROUGH SKIN.

Do not ingest. Avoid prolonged contact with eyes, skin, and clothing. Keep away from heat, sparks and flame. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Risk of cancer depends on duration and level of exposure.

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Eyes : May cause severe irritation, redness, tearing, blurred vision and conjunctivitis.

Skin : Prolonged or repeated contact may cause moderate irritation, defatting (cracking), redness, itching, inflammation, dermatitis and possible secondary infection. High pressure skin injections are **SERIOUS MEDICAL EMERGENCIES**. Injury may not appear serious at first. Within a few hours, tissues will become swollen, discolored and extremely painful.

Inhalation : Nasal and respiratory tract irritation, central nervous system effects including excitation, euphoria, contracted eye pupils, dizziness, drowsiness, blurred vision, fatigue, nausea, headache, loss of reflexes, tremors, convulsions, seizures, loss of consciousness, coma, respiratory arrest and sudden death could occur as a result of long term and/or high concentration exposure to vapors. May also cause anemia and irregular heart rhythm. Repeated or prolonged exposure may cause behavioral changes.

Ingestion : Toxic if swallowed. This product may be harmful or fatal if swallowed. This product may cause nausea, vomiting, diarrhea and restlessness. **DO NOT INDUCE VOMITING**. Aspiration into the lungs can cause severe chemical pneumonitis or pulmonary edema/hemorrhage, which can be fatal. May cause gastrointestinal disturbances. Symptoms may include irritation, depression, vomiting and diarrhea. May cause harmful central nervous system effects, similar to those listed under "inhalation".

Medical conditions aggravated by overexposure: : Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs. Preexisting eye, skin, heart, central nervous system and respiratory disorders may be aggravated by exposure to this product. Impaired kidney, liver and blood disorders may be aggravated by exposure to this product.

Over-exposure signs/symptoms : Nasal and respiratory tract irritation, central nervous system effects including excitation, euphoria, contracted eye pupils, dizziness, drowsiness, blurred vision, fatigue, nausea, headache, loss of reflexes, tremors, convulsions, seizures, loss of consciousness, coma, respiratory arrest or sudden death could occur as a result of long term and/or high concentration exposure to vapors. May also cause anemia and irregular heart rhythm.

See toxicological Information (section 11)

Section 4. First Aid Measures

- Eye contact** : Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Seek medical advice if pain or redness continues.
- Skin contact** : Remove contaminated clothing and shoes. Wash exposed area thoroughly with soap and water. Remove contaminated clothing promptly and launder before reuse. Contaminated leather goods should be discarded. If irritation persists or symptoms described in the MSDS develop, seek medical attention. High pressure skin injections are **SERIOUS MEDICAL EMERGENCIES**. Get immediate medical attention.
- Inhalation** : If inhaled, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.
- Ingestion** : This product may be harmful or fatal if swallowed. This product may cause nausea, vomiting, diarrhea and restlessness. **DO NOT INDUCE VOMITING**. Aspiration into the lungs can cause severe chemical pneumonitis or pulmonary edema/hemorrhage, which can be fatal. May cause gastrointestinal disturbances. Symptoms may include irritation, depression, vomiting and diarrhea. May cause harmful central nervous system effects, similar to those listed under "inhalation".
- Notes to physician** : In case of ingestion, gastric lavage with activated charcoal can be used promptly to prevent absorption. Consideration should be given to the use of an intratracheal tube, to prevent aspiration. Irregular heart beat may occur, use of adrenalin is not advisable. Individuals intoxicated by the product should be hospitalized immediately, with acute and continuing attention to neurological and cardiopulmonary function. Positive pressure ventilation may be necessary. After the initial episode, individuals should be monitored for changes in blood variables and the delayed appearance of pulmonary edema and chemical pneumonitis. Such patients should be monitored for several days or weeks for delayed effects, including bone marrow toxicity, hepatic and renal impairment. Individuals with chronic pulmonary disease will be more seriously impaired, and recovery from inhalation exposure may be complicated. In case of skin injection, prompt debridement of the wound is necessary to minimize necrosis and tissue loss.

Section 5. Fire Fighting Measures

- Flammability of the product** : Flammable.
- Auto-ignition temperature** : >260°C (500°F)
- Flash point** : Closed cup: -40°C (-40°F).
- Flammable limits** : Lower: 1.3% Upper: 7.1%
- Products of combustion** : These products are carbon oxides (CO, CO₂), nitrogen and sulfur oxides (NO_x, SO_x), particulate matter, VOC's.
- Fire hazards in presence of various substances** : Extremely flammable in presence of open flames, sparks and static discharge.
- Explosion hazards in presence of various substances** : Explosive in presence of open flames, sparks and static discharge.
- Fire fighting media and instructions** : Flammable Liquid. Use dry chemical, foam or carbon dioxide to extinguish the fire. Consult foam manufacturer for appropriate media, application rates and water/foam ratio. Subsurface application is only recommended where it is known that the fuel contains less than 3% oxygenated blending components. Water can be used to cool fire- exposed containers, structures and to protect personnel. If a leak or spill has not ignited, ventilate area and use water spray to disperse gas or vapor and to protect personnel attempting to stop a leak. Use water to flush spills away from sources of ignition. Do not flush down public sewers.
- Collect contaminated fire fighting water separately. It must not enter the sewage system. Dike area of fire to prevent product run-off. Decontaminate emergency personnel and equipment with soap and water.

Special protective equipment for fire-fighters**Special remarks on fire hazards**

Highly flammable liquid and vapor. Vapor may cause flash fire. Vapors may accumulate in low or confined areas, travel considerable distance to source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.

: Fire fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full facepiece operated in positive pressure mode.

: Dangerous when exposed to heat or flame. Vapors form flammable or explosive mixtures with air at room temperature. Vapor or gas may spread to distant ignition sources (pilot lights, welding equipment, electrical equipment, etc.) and flash back. Vapors may accumulate in low areas. Vapors may concentrate in confined areas. Flowing product can be ignited by self generated static electricity. Use adequate bonding and grounding to prevent static buildup. Runoff to sewer may cause fire or explosion hazard. Containers may explode in heat of fire. Irritating or toxic substances may be emitted upon thermal decomposition. For fires involving this material, do not enter any enclosed or confined space without proper protective equipment, which may include NIOSH approved self-contained breathing apparatus with full face mask. Clothing, rags or similar organic material contaminated with this product and stored in a closed space may undergo spontaneous combustion. Transfer to and from commonly bonded and grounded containers.

Special remarks on explosion hazards

: No additional remark.

Section 6. Accidental Release Measures**Personal precautions**

: Immediately contact emergency personnel. Eliminate all ignition sources. Keep unnecessary personnel away. Use suitable protective equipment (Section 8). Do not touch or walk through spilled material. Tanks, vessels or other confined spaces which have contained product should be freed of vapors before entering. The container should be checked to ensure a safe atmosphere before entry. Empty containers may contain toxic, flammable/combustible or explosive residues or vapors. Do not cut, grind, drill, weld or reuse empty containers that contained this product. Do not transfer this product to another container unless the container receiving the product is labeled with proper DOT shipping name, hazard class and other information that describes the product and its hazards.

Environmental precautions

: Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Gasoline may contain oxygenated blend products (Ethanol, MTBE, etc.) that are soluble in water and therefore precautions should be taken to protect surface and groundwater sources from contamination. If facility or operation has an "oil or hazardous substance contingency plan", activate its procedures. Stay upwind and away from spill. Wear appropriate protective equipment including respiratory protection as conditions warrant. Do not enter or stay in area unless monitoring indicates that it is safe to do so. Isolate hazard area and restrict entry to emergency crew. Extremely flammable. Review Fire and Explosion Hazard Data before proceeding with clean up. Keep all sources of ignition (flames, smoking, flares, etc.) and hot surfaces away from release. Contain spill in smallest possible area. Recover as much product as possible (e.g., by vacuuming). Stop leak if it can be done without risk. Use water spray to disperse vapors. Spilled material may be absorbed by an appropriate absorbent, and then handled in accordance with environmental regulations. Prevent spilled material from entering sewers, storm drains, other unauthorized treatment or drainage systems and natural waterways. Contact fire authorities and appropriate federal, state and local agencies. If spill of any amount is made into or upon navigable waters, the contiguous zone, or adjoining shorelines, contact the National Response Center at 800-424- 8802. For highway or railway spills, contact Chemtrec at 800-424-9300.

Methods for cleaning up

: If emergency personnel are unavailable, contain spilled material. For small spills add absorbent (soil may be used in the absence of other suitable materials) and use a non-sparking or explosion proof means to transfer material to a sealed, appropriate container for disposal. For large spills dike spilled material or otherwise contain material to ensure runoff does not reach a waterway. Place spilled material in an appropriate container for disposal.

Section 7. Handling and Storage

Handling

: Do not ingest. Avoid prolonged contact with eyes, skin, and clothing. Keep container closed. Use only with adequate ventilation. Keep away from heat, sparks and flame. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Wash thoroughly after handling. Use only in well ventilated locations. Keep away from heat, spark and flames. In case of fire, use water spray, foam, dry chemical or carbon dioxide as described in the Fire and Explosion Hazard Data section of the MSDS. Do not pressurize, cut, weld, braze, solder, drill on or near this container. "Empty" container contains residue (liquid and/or vapor) and may explode in heat of a fire.

Keep out of reach of children. Failure to use caution may cause serious injury or illness. Never siphon by mouth. For use as a motor fuel only. Do not use as a cleaning solvent or for other non-motor fuel uses. To prevent ingestion and exposure - Do not siphon by mouth to transfer product between containers. Use good personal hygiene practices. After handling this product, wash hands before eating, drinking, or using toilet facilities.

Storage

: Store in tightly closed containers in cool, dry, isolated and well ventilated area away from heat, sources of ignition and incompatible materials. Use non-sparking tools and explosion proof equipment. Ground lines, containers, and other equipment used during product transfer to reduce the possibility of a static induced spark. Do not "switch load" because of possible accumulation of a static charge resulting in a source of ignition. Use good personal hygiene practices. After handling this product, wash hands before eating, drinking, smoking or using toilet facilities.

Section 8. Exposure Controls, Personal Protection

Engineering controls

: Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective occupational exposure limits. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal protection

Eyes

: Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts. Keep away from eyes. Eye contact can be avoided by wearing safety glasses or chemical splash goggles.

Skin

: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Keep away from skin. Skin contact can be minimized by wearing protective gloves such as neoprene, nitrile-butadiene rubber, etc. and, where necessary, impervious clothing and boots. Leather goods contaminated with this product should be discarded. A source of clean water should be available in the work area for flushing eyes and skin. Flame Retardant Clothing is recommended.

Respiratory

: Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. If workplace exposure limits for product or components are exceeded, NIOSH approved equipment should be worn. Proper respirator selection should be determined by adequately trained personnel, based on the contaminants, the degree of potential exposure and published respiratory protection factors. This equipment should be available for nonroutine and emergency use.

Hands

: Chemical-resistant, impervious gloves or gauntlets complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Personal protective equipment (Pictograms)

: Consult your Supervisor or S.O.P. for special handling directions.



Personal protection in case of a large spill : Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self-contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Component**Exposure limits**

Gasoline

ACGIH TLV (United States, 5/2004).

STEL: 500 ppm 15 minute(s). Form: All forms

TWA: 300 ppm 8 hour(s). Form: All forms

Hexane (Other Isomers)

ACGIH TLV (United States, 9/2004).

STEL: 1000 ppm 15 minute(s). Form: All forms

TWA: 500 ppm 8 hour(s). Form: All forms

NIOSH REL (United States, 6/2001).

CEIL: 510 ppm 15 minute(s). Form: All forms

Toluene

ACGIH TLV (United States, 5/2004). Skin Notes: 1996 Adoption**Refers to Appendix A – Carcinogens.**

TWA: 50 ppm 8 hour(s). Form: All forms

NIOSH REL (United States, 6/2001).

STEL: 150 ppm 15 minute(s). Form: All forms

TWA: 100 ppm 10 hour(s). Form: All forms

OSHA PEL Z2 (United States, 6/2002).

AMP: 500 ppm 10 minute(s). Form: All forms

CEIL: 300 ppm Form: All forms

TWA: 200 ppm 8 hour(s). Form: All forms

Xylene (o,m,p isomers)

ACGIH TLV (United States, 5/2004).

STEL: 150 ppm 15 minute(s). Form: All forms

TWA: 100 ppm 8 hour(s). Form: All forms

OSHA PEL (United States, 6/1993).

TWA: 100 ppm 8 hour(s). Form: All forms

NIOSH REL (United States, 6/2001).

CEIL: 385 ppm 15 minute(s). Form: All forms

TWA: 75 ppm 10 hour(s). Form: All forms

OSHA PEL (United States, 6/1993).

TWA: 500 ppm 8 hour(s). Form: All forms

ACGIH TLV (United States, 3/2004). Notes: 1999 Adoption.

TWA: 300 ppm 8 hour(s). Form: All forms

ACGIH TLV (United States, 1/2004). Notes: 2002 Adoption.

TWA: 50 ppm 8 hour(s). Form: All forms

Ethanol

ACGIH TLV (United States, 5/2004). Notes: 1996 Adoption Refers to Appendix A – Carcinogens.

TWA: 1000 ppm 8 hour(s). Form: All forms

NIOSH REL (United States, 6/2001).

TWA: 1000 ppm 10 hour(s). Form: All forms

OSHA PEL (United States, 6/1993).

TWA: 1000 ppm 8 hour(s). Form: All forms

NIOSH REL (United States, 6/2001).

TWA: 25 ppm 10 hour(s). Form: All forms

1,2,4-Trimethylbenzene

ACGIH TLV (United States, 9/2004).

STEL: 500 ppm 15 minute(s). Form: All forms

TWA: 400 ppm 8 hour(s). Form: All forms

NIOSH REL (United States, 6/2001).TWA: 350 mg/m³ 10 hour(s). Form: All forms**OSHA PEL (United States, 6/1993).**

TWA: 500 ppm 8 hour(s). Form: All forms

Pentane

ACGIH TLV (United States, 9/2004). Notes: 1998 Adoption.

TWA: 600 ppm 8 hour(s). Form: All forms

	TWA: 600 ppm 8 hour(s). Form: All forms NIOSH REL (United States, 6/2001). CEIL: 610 ppm 15 minute(s). Form: All forms TWA: 120 ppm 10 hour(s). Form: All forms OSHA PEL (United States, 6/1993). TWA: 1000 ppm 8 hour(s). Form: All forms ACGIH TLV (United States, 1/2004). Notes: 2002 Adoption. TWA: 20 ppm 8 hour(s). Form: All forms ACGIH TLV (United States, 1/2004). STEL: 125 ppm 15 minute(s). Form: All forms TWA: 100 ppm 8 hour(s). Form: All forms NIOSH REL (United States, 6/2001). STEL: 125 ppm 15 minute(s). Form: All forms TWA: 100 ppm 10 hour(s). Form: All forms OSHA PEL (United States, 6/1993). TWA: 100 ppm 8 hour(s). Form: All forms ACGIH TLV (United States, 3/2004). Notes: 1999 Adoption. TWA: 50 ppm 8 hour(s). Form: All forms NIOSH REL (United States, 6/2001). Skin TWA: 50 ppm 10 hour(s). Form: All forms OSHA PEL (United States, 6/1993). Skin TWA: 50 ppm 8 hour(s). Form: All forms NIOSH REL (United States, 6/2001). Notes: See Appendix A - NIOSH Potential Occupational Carcinogen STEL: 1 ppm 15 minute(s). Form: All forms TWA: 0.1 ppm 10 hour(s). Form: All forms ACGIH TLV (United States, 5/2004). Skin STEL: 2.5 ppm 15 minute(s). Form: All forms TWA: 0.5 ppm 8 hour(s). Form: All forms OSHA PEL (United States, 6/1993). STEL: 5 ppm 15 minute(s). Form: All forms TWA: 1 ppm 8 hour(s). Form: All forms ACGIH TLV (United States, 1/2004). TWA: 100 ppm 8 hour(s). Form: All forms NIOSH REL (United States, 6/2001). TWA: 300 ppm 10 hour(s). Form: All forms OSHA PEL (United States, 6/1993). TWA: 300 ppm 8 hour(s). Form: All forms OSHA PEL (United States, 6/1993). TWA: 500 ppm 8 hour(s). Form: All forms ACGIH TLV (United States, 9/2004). Skin TWA: 50 ppm 8 hour(s). Form: All forms NIOSH REL (United States, 6/2001). TWA: 50 ppm 10 hour(s). Form: All forms
Tertiary Amyl Methyl Ether (TAME)	
Ethylbenzene	
Cumene	
Benzene	
Cyclohexane	
n-Hexane	

Consult local authorities for acceptable exposure limits.

Section 9. Physical and Chemical Properties

Physical state	: Liquid.
Color	: Light Straw to Red Clear Liquid
Odor	: Characteristic Gasoline Odor (Strong.)
Boiling point	: 26.7 to 226.7°C (80.1 to 440.1°F)
Melting/freezing point	: May start to solidify at 6.67°C (44°F) based on data for: Cyclohexane. Weighted average: -91.9°C (-133.4°F)
Specific gravity	: 0.66 to 0.75 (Water = 1) (@ 60 °F)
Vapor pressure	: 60.8 to 101.3 kPa (456 to 760 mm Hg) (at 20°C)
Vapor density	: 3 to 4 (Air = 1)
Volatility	: Essentially 100%

Continued on next page

Evaporation rate : 10 to 11 compared to Butyl acetate.
Solubility : Very slightly soluble in cold water, hot water.

Section 10. Stability and Reactivity Data

Stability and reactivity : The product is stable.
Incompatibility with various substances : Reactive with oxidizing agents, reducing agents, acids, alkalis.
Hazardous decomposition products : These products are carbon oxides (CO, CO₂), nitrogen and sulfur oxides (NO_x, SO_x), particulate matter, VOC's.
Hazardous polymerization : Will not occur.

Section 11. Toxicological Information

Toxicity data

BENZENE is considered to be a carcinogen to humans, and may cause adverse health effects following exposure via inhalation, ingestion or dermal or eye contact. Acute inhalation of benzene by rats, mice or rabbits caused narcosis, spontaneous heart contractions (ventricular fibrillation) and death due to respiratory paralysis. Subchronic inhalation of benzene by rats produced decreased white blood cell counts, decreased bone marrow cell activity, increased red blood cell activity and cataracts. In rats, chronic inhalation or oral administration of benzene produced cancers of the liver, mouth and Zymbal gland. Acute inhalation exposure of benzene in humans has caused nerve inflammation (polyneuritis), central nervous system depression and cardiac sensitization. Chronic exposure to benzene has produced anorexia and irreversible injury to the blood forming organs. Potential effects include aplastic anemia and leukemia. It has caused fetal defects in tests on laboratory animals.

CUMENE can affect the body if it is inhaled, swallowed or comes in contact with the eyes or skin. The main toxic effect is irritation of the eyes, skin and upper respiratory tract. Narcosis has been reported to occur in animals on high exposure. There are no reports of systemic effects in man as a result of industrial exposure. Chronic exposure of rats above 500 ppm causes congestion of lungs, liver and kidneys, but no bone marrow changes.

CYCLOHEXANE can affect the body if it is inhaled, swallowed, or comes in contact with the eyes or skin. It is primarily a local irritant and central nervous system depressant. The depressant effect is from exposure to concentrations above 12,000 ppm, while prolonged or repeated exposure to concentrations above 300 ppm produces a mild irritation of the eyes and upper respiratory tract.

ETHANOL is rapidly absorbed through the gastrointestinal tract and normally metabolized and excreted in a relatively few hours. Only in very unusual work situations could the inhalation of ethanol vapors result in symptoms of alcohol intoxication. Can be fatal or cause blindness if swallowed in extreme quantities. Inhalation or ingestion can cause headache, nausea, dizziness or narcosis. Chronic overexposure (inhalation or ingestion) can cause damage to the gastrointestinal tract, liver, kidneys and cardiovascular system. Prolonged contact causes irritation to skin and eyes. Medical conditions aggravated by exposure include kidney, liver, heart and GI conditions. This material is not listed as a cancer causing agent but is suspected of being a promoter.

ETHYLBENZENE can affect the body if it is inhaled, swallowed or comes in contact with the eyes or skin. It is primarily an irritant of skin, and to some degree, of eyes and upper respiratory tract. Systemic absorption causes depression of the central nervous system with narcosis at very high concentrations. On the eyes and nose, the vapor at 5000 ppm causes intolerable irritation, eye irritation and lacrimation are immediate and severe at 2000 ppm, irritation and tearing occur at 1000 ppm although tolerance develops rapidly, and the vapor is a transient irritant on human eyes at 200 ppm. Aspiration of small amounts causes extensive edema and hemorrhage of lung tissue. A draft report on a study conducted by the National Toxicology program states that lifetime inhalation exposure of rats and mice to concentrations of ethylbenzene (750 ppm) resulted in increases in certain types of cancer, including kidney tumors in rats and lung and liver tumors in mice. These effects were not observed in animals exposed to lower concentrations of ethylbenzene (75 ppm or 250 ppm). The draft report does not address the relevance of these results to humans.

GASOLINE contains benzene, as well as n-hexane, other aromatics and certain olefins. Gasoline generally acts as an anesthetic and mucous membrane irritant. Inhalation is the most important route of occupational entry. Eye and throat irritation occur in several hours at exposures of 160 to 270 ppm, eye, nose and throat irritation and dizziness occurs at exposures of 500 to 900 ppm in one hour, mild anesthesia occurs in 30 minutes at exposures of 2000 ppm. The threshold for immediate mild toxic effect is 900 to 1000 ppm. There are reports of toxic neuritis after exposure to gasoline. Repeated exposure of laboratory animals to high concentrations of gasoline vapors has caused kidney damage and cancer in rats and cancer in mice. Gasoline was evaluated for genetic activity in assays using microbial cells, cultured mammalian cells and rat bone marrow cells. The results were all negative so gasoline was considered nonmutagenic under these conditions. Overexposure to this product or its components has been suggested as a cause of liver abnormalities in laboratory animals and humans. Lifetime studies by the American Petroleum Institute have shown that kidney damage and kidney cancer can occur in male rats after prolonged inhalation exposures at elevated concentrations of total gasoline. Kidneys of mice and female rats were unaffected. The U.S. EPA Risk Assessment Forum has concluded that the male rat kidney tumor results are not relevant for humans. Total gasoline exposure also produced liver tumors in female mice only. The implication of these data for humans has not been determined.

HEPTANE can affect the body if it is inhaled, comes in contact with the eyes or skin, or is swallowed. Heptane vapor is a narcotic. Concentrations of 10,000 to 15,000 ppm produced narcosis in mice within 30 to 60 minutes, while 15,000 to 20,000 ppm caused convulsions and death. At 48,000 ppm, respiratory arrest was produced in mice in 3 to 4 minutes from the start of exposure. Human subjects exposed to 1,000 ppm for 6 minutes, or to 2,000 ppm for 4 minutes, reported slight vertigo. At 5,000 ppm for 4 minutes, there was marked vertigo, inability to walk a straight line, hilarity, and incoordination, but no complaints of eye and upper respiratory tract or mucous membrane irritation. A 15-minute exposure at 5,000 ppm produced in some subjects a state of stupor lasting for 30 minutes after exposure. These subjects also reported loss of appetite, slight nausea, and a taste resembling gasoline for several hours after exposure. Although chronic nervous system effects have not been attributed to heptane, polyneuritis has been reported following prolonged exposure to a petroleum fraction with boiling range between 70°C and 100°C, and this fraction would normally contain various isomers of heptane as major ingredients.

n-HEXANE can affect the body if it is inhaled, comes in contact with the eyes or skin, or is swallowed. Hexane vapor is a narcotic and a mild upper respiratory irritant. Polyneuropathy (peripheral nerve damage) has been reported to occur in workers exposed to hexane vapors, characterized by progressive weakness and numbness in the extremities, loss of deep tendon reflexes and reduction of motor nerve conduction velocity. Recovery ranges from no recovery to complete recovery depending upon the duration of exposure and severity of nerve damage. Concentrations of 30,000 ppm produced narcosis in mice within 30 to 60 minutes, convulsions and death occurred at 35,000 to 40,000 ppm, and at 64,000 ppm respiratory arrest was produced in 2.5 to 4.5 minutes from the start of exposure. Concentrations up to 8000 ppm produced no anesthesia. In human subjects, 2000 ppm for 10 minutes produced no effects, but 5000 ppm resulted in dizziness and a sensation of giddiness. Other investigators reported slight nausea, headache and irritation of the eyes and throat at 1400 to 1500 ppm. In industrial practice, mild narcotic symptoms such as dizziness have been observed when concentrations exceeded 1000 ppm, but not below 500 ppm.

MTBE is a mild irritant to the eye. An increase in anesthesia with increasing concentrations was observed during a rat exposure study. Controlled human exposure to MTBE in air under relatively temperate conditions does not cause increased symptoms or measurable responses (irritation, behavioral changes) in healthy adult subjects. Although MTBE and TBA were detectable in the blood of subjects in clinical studies, no increase in symptoms occurred. A tentative review of the carcinogenicity (i.e., a tentative C classification). A sensitivity analysis of cancer risk indices also suggests that, if MTBE is carcinogenic, its potency is not likely to be greater than that already assigned to gasoline itself, which currently has a hazard classification of "probable" human carcinogen.

OCTANE can affect the body if it is inhaled, comes in contact with the skin or eyes or is swallowed. Octane vapor is a mild narcotic and mucous membrane irritant. Concentrations of 6600 to 13,700 ppm produced narcosis in mice in 30 to 90 minutes, the fatal concentration for animals is near 13,500 ppm. No chronic systemic effects have been reported in humans.

PENTANE can affect the body if it is inhaled, comes in contact with the eyes or skin, or is swallowed. The chief effects of inhalation are narcosis and irritation of the respiratory passages. Exposures of 90,000 to 120,000 ppm resulted in narcosis in animals in 5 to 6 minutes, 130,000 ppm was fatal with respiratory arrest occurring within 5 minutes of exposure. Pentane injected subcutaneously in rats produced temporary impairment of liver function and moderate neutropenia. While other aliphatic hydrocarbons produce drowsiness and mild irritation of the eyes and nose in human subjects, no symptoms resulted from exposure to pentane vapor for 10 minutes at 5000 ppm. Chronic exposure to high concentrations may lead to polyneuropathy (peripheral nerve damage), characterized by progressive weakness and numbness in the extremities, loss of deep tendon reflexes and reduction of motor nerve conduction velocity.

TOLUENE can affect the body if it is inhaled, comes in contact with the eyes or skin or it is swallowed. It may also enter the body through the skin. Toluene vapors cause narcosis. Controlled exposures of human subjects to 200 ppm for 8 hours produced mild fatigue, weakness, confusion, lacrimation and paresthesia. At 600 ppm for 8 hours, there was euphoria, headache, dizziness, dilated pupils and nausea. At 800 ppm for 8 hours, symptoms were more pronounced, and after effects included nervousness, muscular fatigue and insomnia persisting for several days. In workers exposed for many years to concentrations in the range of 80 to 300 ppm, there was no clinical or laboratory evidence of altered liver function. Toluene exposure does not result in the same chronic injury to bone marrow caused by benzene. Liquid splashed in the eyes of workers has caused transient corneal damage and conjunctival irritation, complete recovery occurred within 48 hours. Animal studies have shown that inhalation of high levels of toluene produced cardiac sensitization. Such sensitization may cause fatal changes in heart rhythms. This later effect was shown to be enhanced by hypoxia or the injection of adrenalin-like agents. Workers exposed at less than 200 ppm have complained of headache, lassitude and nausea, but physical findings were essentially negative. At concentrations between 200 and 500 ppm, impairment of coordination, momentary loss of memory and anorexia were present. Between 500 and 1500 ppm, palpitation, extreme weakness, pronounced loss of coordination and impairment of reaction time were noted. The red cell count fell in many instances and there were cases of aplastic anemia in which recovery followed intensive hospital treatment (although some of the effects may have been due to benzene impurity). Toluene has been reported to decrease immunological responses and cause recordable hearing loss in test animals. Damages genetic material in mammalian test systems. May cause adverse reproductive effects based on animal testing.

TRIMETHYL BENZENE (PSEUDOCUMENE) can affect the body if it is inhaled, comes in contact with the eyes or skin or it is swallowed. It may also enter the body through the skin. The liquid is a primary skin irritant, but system intoxication due to absorption through the skin is not probable. High concentrations of vapors (5000 to 9000 ppm) caused central nervous system depression. Pseudocumene may cause nervousness, tension, anxiety, and asthmatic bronchitis. In addition, the peripheral blood showed a tendency to hypochromic anemia and a deviation from the normal in the coagulability of the blood.

XYLENE can affect the body if it is inhaled, comes in contact with the eyes or skin or it is swallowed. It may also enter the body through the skin. Xylene vapor irritates the eyes, mucous membranes and skin. At high concentrations it causes narcosis. In animals, xylene causes blood changes reflecting mild toxicity to the hematopoietic system. Laboratory animals exposed by various routes to high doses of xylene showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals. Rats exposed to xylene vapor during pregnancy showed embryo/fetotoxic effects. Mice exposed orally to doses producing maternal toxicity also showed embryo or fetotoxic effects. Laboratory rats exposed to high concentrations of toluene experienced recordable hearing loss. In humans, exposure to high concentrations can cause dizziness, excitement, drowsiness, incoordination and a staggering gait. Workers exposed to concentrations above 200 ppm complain of anorexia, nausea, vomiting and abdominal pain. Brief exposures of humans to 200 ppm caused irritation of the eyes, nose and throat. There are reports of reversible corneal vacuolation in workers exposed to xylene, or to xylene plus other volatile solvents.

HEXANE ISOMERS are three times as toxic to mice as is pentane. Narcosis was produced in mice within 30-60 minutes at concentrations of 30,000 ppm. In man, concentrations for 10 minutes at 2000 ppm produced no effects, but 5000 ppm caused dizziness and a sense of giddiness. Concentrations of 1400-1500 ppm produced slight nausea, headache, eye, and throat irritation.

<u>Ingredient name</u>	<u>Test</u>	<u>Result</u>	<u>Route</u>	<u>Species</u>
Toluene	LD50	636 mg/kg	Oral	Rat
	LDLo	50 mg/kg	Oral	human
Xylene (o,m,p isomers)	LD50	4300 mg/kg	Oral	Rat
	LD50	2119 mg/kg	Oral	Mouse
	LD50	4300 mg/kg	Oral	Mammal
	LD50	>1700 mg/kg	Dermal	Rabbit
	LDLo	50 mg/kg	Oral	human

Continued on next page

Ethanol	LD50	7060 mg/kg	Oral	Rat
	LD50	6300 mg/kg	Oral	Rabbit
	LD50	3450 mg/kg	Oral	Mouse
	LDLo	1400 mg/kg	Oral	human
	LDLo	5500 mg/kg	Oral	Dog
Tertiary Amyl Methyl Ether (TAME)	LD50	1602 mg/kg	Oral	Rat
Pentane	LD50	400 mg/kg	Oral	Rat
Cumene	LD50	1400 mg/kg	Oral	Rat
	LD50	12750 mg/kg	Oral	Mouse
	LD50	3500 mg/kg	Oral	Rat
Ethylbenzene	LD50	930 mg/kg	Oral	Rat
Benzene	LD50	4700 mg/kg	Oral	Mouse
	LD50	5700 mg/kg	Oral	Mammal
	LD50	48 mg/kg	Dermal	Mouse
	LDLo	50 mg/kg	Oral	man
	LD50	12705 mg/kg	Oral	Rat
Cyclohexane	LD50	813 mg/kg	Oral	Mouse
	LDLo	5500 mg/kg	Oral	Rabbit

Chronic effects on humans : **CARCINOGENIC EFFECTS:** Classified A3 (Proven for animal.) by ACGIH [Gasoline]. Classified A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC [Toluene]. Classified A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC [Xylene (o,m,p isomers)]. Classified A3 (Proven for animal.) by ACGIH [Methyl Tertiary Butyl Ether (MTBE)]. Classified 3 (Not classifiable for human.) by IARC [Methyl Tertiary Butyl Ether (MTBE)]. Classified A4 (Not classifiable for human or animal.) by ACGIH [Ethanol]. Classified A3 (Proven for animal.) by ACGIH, 2B (Possible for human.) by IARC [Ethylbenzene]. Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC, 1 (Known To Be Human Carcinogens.) by NTP, + (Proven.) by OSHA, + (Proven.) by NIOSH [Benzene]. Contains material which causes damage to the following organs: blood, kidneys, lungs, the reproductive system, liver, peripheral nervous system, gastrointestinal tract, upper respiratory tract, skin, bone marrow, central nervous system (CNS), eye, lens or cornea.

Other toxic effects on humans : Extremely hazardous in case of ingestion.
Very hazardous in case of eye contact (irritant),
Hazardous in case of skin contact (irritant).
Slightly hazardous in case of inhalation (lung irritant).

Special remarks on toxicity to animals : No additional remark.

Special remarks on chronic effects on humans : No additional remark.

Special remarks on other toxic effects on humans : No additional remark.

Specific effects

Carcinogenic effects : Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure.

Target organs : Contains material which causes damage to the following organs: blood, kidneys, lungs, the reproductive system, liver, peripheral nervous system, gastrointestinal tract, upper respiratory tract, skin, bone marrow, central nervous system (CNS), eye, lens or cornea.

Section 12. Ecological Information

Ecotoxicity data

<u>Ingredient name</u>	<u>Species</u>	<u>Period</u>	<u>Result</u>
Toluene	Daphnia magna (EC50)	48 hour(s)	6 mg/l
	Daphnia magna (EC50)	48 hour(s)	6.56 mg/l
	Oncorhynchus mykiss (EC50)	48 hour(s)	6.78 mg/l
	Oncorhynchus mykiss (LC50)	96 hour(s)	5.8 mg/l
	Oncorhynchus mykiss (LC50)	96 hour(s)	6.78 mg/l
	Pimephales promelas (LC50)	96 hour(s)	12.6 mg/l
Xylene (o,m,p isomers)	Oncorhynchus mykiss (LC50)	96 hour(s)	3.3 mg/l
	Oncorhynchus mykiss (LC50)	96 hour(s)	8.2 mg/l
	Lepomis macrochirus (LC50)	96 hour(s)	8.6 mg/l
	Lepomis macrochirus (LC50)	96 hour(s)	12 mg/l
	Lepomis macrochirus (LC50)	96 hour(s)	13.3 mg/l
	Pimephales promelas (LC50)	96 hour(s)	13.4 mg/l
Methyl Tertiary Butyl Ether (MTBE)	Pimephales promelas (LC50)	96 hour(s)	672 mg/l
Ethanol	Daphnia magna (EC50)	48 hour(s)	2 mg/l
	Daphnia magna (EC50)	48 hour(s)	9.3 mg/l
	Daphnia magna (EC50)	48 hour(s)	>100 mg/l
	Pimephales promelas (LC50)	96 hour(s)	>100 mg/l
	Daphnia magna (LC50)	96 hour(s)	>100 mg/l
	Oncorhynchus mykiss (LC50)	96 hour(s)	13000 mg/l
1,2,4-Trimethylbenzene	Pimephales promelas (LC50)	96 hour(s)	7.72 mg/l
	Daphnia magna (EC50)	48 hour(s)	10.6 mg/l
	Daphnia magna (EC50)	48 hour(s)	11.2 mg/l
	Oncorhynchus mykiss (LC50)	96 hour(s)	2.7 mg/l
	Poecilia reticulata (LC50)	96 hour(s)	5.1 mg/l
	Pimephales promelas (LC50)	96 hour(s)	6.32 mg/l
Ethylbenzene	Daphnia magna (EC50)	48 hour(s)	2.93 mg/l
	Daphnia magna (EC50)	48 hour(s)	2.97 mg/l
	Selenastrum capricornutum (EC50)	48 hour(s)	7.2 mg/l
	Oncorhynchus mykiss (LC50)	96 hour(s)	4.2 mg/l
	Pimephales promelas (LC50)	96 hour(s)	9.09 mg/l
	Poecilia reticulata (LC50)	96 hour(s)	9.6 mg/l
Benzene	Daphnia magna (EC50)	48 hour(s)	9.23 mg/l
	Daphnia magna (EC50)	48 hour(s)	10 mg/l
	Daphnia magna (EC50)	48 hour(s)	11.73 mg/l
	Oncorhynchus mykiss (LC50)	96 hour(s)	5.3 mg/l
	Oncorhynchus mykiss (LC50)	96 hour(s)	5.9 mg/l
	Oncorhynchus mykiss (LC50)	96 hour(s)	9.2 mg/l
n-Hexane	Pimephales promelas (LC50)	96 hour(s)	2.5 mg/l
	Pimephales promelas (LC50)	96 hour(s)	4.53 mg/l
	Pimephales promelas (LC50)	96 hour(s)	32.71 mg/l
	Lepomis macrochirus (LC50)	96 hour(s)	34.72 mg/l
	Pimephales promelas (LC50)	96 hour(s)	42.33 mg/l
	Poecilia reticulata (LC50)	96 hour(s)	57.68 mg/l
Cyclohexane	Pimephales promelas (LC50)	96 hour(s)	93 mg/l

Products of degradation : These products are carbon oxides (CO, CO₂) and water.

Toxicity of the products of biodegradation : The products of biodegradation are as toxic as the original product.

Special remarks on the products of biodegradation : No additional remark.



Continued on next page

Section 13. Disposal Considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements.

Consult your local or regional authorities.

Section 14. Transport Information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	1203	Gasoline	3	II		Not available.
TDG Classification	1203	Gasoline (Hexane (Other Isomers), Toluene)	3	II		Not available.

Section 15. Regulatory Information

United States

U.S. Federal regulations : TSCA 4(a) final test rules: Hexane (Other Isomers); n-Hexane
TSCA 8(a) PAIR: Tertiary Amyl Methyl Ether (TAME); n-Heptane; Pentane
TSCA 8(b) inventory: Toluene; Hexane (Other Isomers); Xylene (o,m,p isomers); Octane (All Isomers); Methyl Tertiary Butyl Ether (MTBE); Ethanol; Tertiary Amyl Methyl Ether (TAME); 1,2,4-Trimethylbenzene; n-Heptane; Pentane; Cumene; Ethylbenzene; Benzene; n-Hexane; Cyclohexane; Trimethyl Benzene (Pseudocumene); Gasoline
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Toluene; Hexane (Other Isomers); Xylene (o,m,p isomers); Octane (All Isomers); Methyl Tertiary Butyl Ether (MTBE); Ethanol; 1,2,4-Trimethylbenzene; n-Heptane; Pentane; Cumene; Ethylbenzene; Benzene; n-Hexane; Cyclohexane
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Toluene: Fire hazard, Immediate (Acute) Health Hazard, Delayed (Chronic) Health Hazard; Hexane (Other Isomers): Fire hazard, Immediate (Acute) Health Hazard; Xylene (o,m,p isomers): Fire hazard, Immediate (Acute) Health Hazard, Delayed (Chronic) Health Hazard; Octane (All Isomers): Fire hazard; Methyl Tertiary Butyl Ether (MTBE): Fire hazard, Immediate (Acute) Health Hazard; Ethanol: Fire hazard, Immediate (Acute) Health Hazard, Delayed (Chronic) Health Hazard; 1,2,4-Trimethylbenzene: Fire hazard, Delayed (Chronic) Health Hazard; n-Heptane: Fire hazard; Pentane: Fire hazard, Immediate (Acute) Health Hazard; Cumene: Fire hazard, Immediate (Acute) Health Hazard; Ethylbenzene: Fire hazard, Immediate (Acute) Health Hazard, Delayed (Chronic) Health Hazard; Benzene: Fire hazard, Immediate (Acute) Health Hazard, Delayed (Chronic) Health Hazard; n-Hexane: Fire hazard, Immediate (Acute) Health Hazard, Delayed (Chronic) Health Hazard; Cyclohexane: Fire hazard, Immediate (Acute) Health Hazard, Delayed (Chronic) Health Hazard; Gasoline: Fire hazard, Immediate (Acute) Health Hazard, Delayed (Chronic) Health Hazard
Clean Water Act (CWA) 307: Toluene; Ethylbenzene; Benzene
Clean Water Act (CWA) 311: Toluene; Xylene (o,m,p isomers); Ethylbenzene; Benzene; Cyclohexane
Clean air act (CAA) 112 accidental release prevention: Pentane
Clean air act (CAA) 112 regulated flammable substances: Pentane

Continued on next page

Clean air act (CAA) 112 regulated toxic substances: No products were found.

SARA 313

	<u>Product name</u>	<u>CAS number</u>	<u>Concentration</u>
Form R - Reporting requirements	: Toluene	108-88-3	0 - 30
	Xylene (o,m,p isomers)	1330-20-7	0 - 25
	Methyl Tertiary Butyl Ether (MTBE)	1634-04-4	0 - 16
	1,2,4-Trimethylbenzene	95-63-6	0 - 6
	Cumene	98-82-8	0 - 5
	Ethylbenzene	100-41-4	0 - 5
	Benzene	71-43-2	0 - 4.9
	n-Hexane	110-54-3	0 - 3
	Cyclohexane	110-82-7	0 - 3
Supplier notification	: Toluene	108-88-3	0 - 30
	Xylene (o,m,p isomers)	1330-20-7	0 - 25
	Methyl Tertiary Butyl Ether (MTBE)	1634-04-4	0 - 16
	1,2,4-Trimethylbenzene	95-63-6	0 - 6
	Cumene	98-82-8	0 - 5
	Ethylbenzene	100-41-4	0 - 5
	Benzene	71-43-2	0 - 4.9
	n-Hexane	110-54-3	0 - 3
	Cyclohexane	110-82-7	0 - 3

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

State regulations

: Connecticut carcinogen reporting list.: Benzene
 Connecticut hazardous material survey.: Toluene; Xylene (o,m,p isomers); Ethanol; Cumene; Ethylbenzene; Benzene; n-Hexane; Gasoline
 Illinois toxic substances disclosure to employee act: Toluene; Xylene (o,m,p isomers); Ethanol; Cumene; Ethylbenzene; Benzene; n-Hexane; Gasoline
 Rhode Island RTK hazardous substances: Toluene; Xylene (o,m,p isomers); Ethanol; Cumene; Ethylbenzene; Benzene; n-Hexane; Gasoline
 Pennsylvania RTK: Toluene: (environmental hazard, generic environmental hazard); Hexane (Other Isomers): (generic environmental hazard); Xylene (o,m,p isomers): (environmental hazard, generic environmental hazard); Octane (All Isomers): (generic environmental hazard); Methyl Tertiary Butyl Ether (MTBE): (environmental hazard, generic environmental hazard); Ethanol: (generic environmental hazard); 1,2,4-Trimethylbenzene: (environmental hazard, generic environmental hazard); n-Heptane: (generic environmental hazard); Pentane: (generic environmental hazard); Cumene: (environmental hazard, generic environmental hazard); Ethylbenzene: (environmental hazard, generic environmental hazard); Benzene: (special hazard, environmental hazard, generic environmental hazard); n-Hexane: (generic environmental hazard); Cyclohexane: (environmental hazard, generic environmental hazard); Trimethyl Benzene (Pseudocumene): (generic environmental hazard); Gasoline: (generic environmental hazard)
 Florida: Toluene; Xylene (o,m,p isomers); Ethanol; Cumene; Ethylbenzene; Benzene; n-Hexane; Gasoline
 Michigan critical material: Toluene; Xylene (o,m,p isomers); Cumene; Benzene
 Massachusetts RTK: Toluene; Hexane (Other Isomers); Xylene (o,m,p isomers); Octane (All Isomers); Methyl Tertiary Butyl Ether (MTBE); Ethanol; 1,2,4-Trimethylbenzene; n-Heptane; Pentane; Cumene; Ethylbenzene; Benzene; n-Hexane; Cyclohexane; Trimethyl Benzene (Pseudocumene); Gasoline
 New Jersey: Toluene; Xylene (o,m,p isomers); Octane (All Isomers); Methyl Tertiary Butyl Ether (MTBE); Ethanol; 1,2,4-Trimethylbenzene; n-Heptane; Pentane; Cumene; Ethylbenzene; Benzene; n-Hexane; Cyclohexane; Trimethyl Benzene (Pseudocumene); Gasoline
 Louisiana RTK reporting list: Gasoline

WARNING: This product contains chemical(s) known to the state of California to cause cancer, birth defects or other reproductive harm: Toluene; Benzene

WARNING: This product contains chemical(s) known to the state of California to cause reproductive harm (male): Benzene

California prop. 65 (no significant risk level): Benzene

California prop. 65 (acceptable daily intake level): Toluene; Benzene

WARNING: This product contains chemical(s) known to the state of California to cause birth defects or other reproductive harm.: Toluene; Benzene

WARNING: This product contains chemical(s) known to the state of California to cause cancer.: Benzene

Canada

WHMIS (Canada)

- : Class B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).
- : Class D-1A: Material causing immediate and serious toxic effects (VERY TOXIC).
- : Class D-2A: Material causing other toxic effects (VERY TOXIC).
- : Class D-2B: Material causing other toxic effects (TOXIC).
- : CEPA DSL: Toluene; Hexane (Other Isomers); Xylene (o,m,p isomers); Octane (All Isomers); Methyl Tertiary Butyl Ether (MTBE); Ethanol; Tertiary Amyl Methyl Ether (TAME); 1,2,4-Trimethylbenzene; n-Heptane; Pentane; Cumene; Ethylbenzene; Benzene; n-Hexane; Cyclohexane; Trimethyl Benzene (Pseudocumene); Gasoline

Section 16. Other Information

Label Requirements

- : CANCER HAZARD
- : CONTAINS MATERIAL WHICH CAN CAUSE CANCER
- : HIGHLY FLAMMABLE LIQUID AND VAPOR.
- : HARMFUL IF SWALLOWED.
- : CONTAINS MATERIAL WHICH CAUSES DAMAGE TO THE FOLLOWING ORGANS: BLOOD, KIDNEYS, LUNGS, REPRODUCTIVE SYSTEM, LIVER, PERIPHERAL NERVOUS SYSTEM, GASTROINTESTINAL TRACT, RESPIRATORY TRACT, SKIN, BONE MARROW, CENTRAL NERVOUS SYSTEM, EYE, LENS OR CORNEA.
- : VAPOR MAY CAUSE FLASH FIRE.
- : MAY BE HARMFUL IF ABSORBED THROUGH SKIN.

Hazardous Material Information System (U.S.A.)

Health	1
Fire hazard	3
Physical Hazard	0
Personal protection	

National Fire Protection Association (U.S.A.)



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- Version : 1

Disclaimer

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Continued on next page

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Definitions of Material Safety Data Sheet Terminology

GOVERNMENT AGENCIES AND PRIVATE ASSOCIATIONS

ACGIH - American Conference of Governmental Industrial Hygienists, (private association)
DOT - United States Department of Transportation
EPA - United States Environmental Protection Agency
IARC - International Agency for Research on Cancer, (private association)
NFPA - National Fire Protection Association, (private association)
MSHA - Mine Safety and Health Administration, U.S. Department of Labor
NIOSH - National Institute of Occupational Safety and Health, U.S. Department of Health and Human Services
NTP - National Toxicology Program, (private association)
OSHA - Occupational Safety and Health Administration, U.S. Department of Labor
WHMIS - Workplace Hazardous Material Information System
CSA - Canadian Standards Association

HAZARD AND EXPOSURE INFORMATION

Acute Hazard - An adverse health effect which occurs rapidly as a result of short term exposure.
CAS # - American Chemical Society's Chemical Abstract service registry number which identifies the product and/or ingredients.
Ceiling - The concentration that should not be exceeded during any part of the working exposure
Chronic Hazard - An adverse health effect which generally occurs as a result of long term exposure or short term exposure with delayed health effects and is of long duration
Fire Hazard - A material that poses a physical hazard by being flammable, combustible, pyrophoric or an oxidizer as defined by 29 CFR 1910.1200
Hazard Class - DOT hazard classification
Hazardous Ingredients - Names of ingredients which have been identified as health hazards
IDLH - Immediately Dangerous to Life and Health, the airborne concentration below which a person can escape without respiratory protection and exposure up to 30 minutes, and not suffer debilitating or irreversible health effects. Established by NIOSH.
mg/m3 - Milligrams of contaminant per cubic meter of air, a mass to volume ratio
N/A - Not available or no relevant information found
NA - Not applicable
PEL - OSHA permissible exposure limit; an action level of one half this value may be applicable
ppm - Part per million (one volume of vapor or gas in one million volumes of air)
Pressure Hazard - A material that poses a physical hazard due to the potential of a sudden release of pressure such as explosive or a compressed gas as defined by 29 CFR 1910.1200
Reactive Hazard - A material that poses a physical hazard due to the potential to become unstable reactive, water reactive or that is an organic peroxide as defined by 29 CFR 1910.1200.
STEL - The ACGIH Short-Term Exposure Limit, a 15-minute Time-Weighted Average exposure which should not be exceeded at any time during a workday, even if the 8-hour TWA is less than the TLV.
TLV - ACGIH Threshold Limit Value, represented herein as an 8-hour TWA concentration.
8-hour TWA - The time weighted average concentration for a normal 8-hour workday and a 40-hour workweek, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect.
LD50 - Single dose of a substance that, when administered by a defined route in an animal assay, is expected to cause the death of 50% of the defined animal population.
LC50 - The concentration of a substance in air that, when administered by means of inhalation over a specified length of time in an animal assay, is expected to cause the death of 50% of a defined animal population.



Material Safety Data Sheet

Havoline® Motor Oil

MSDS: 8599 Revision #: 1 Revision Date: 9/13/2002

[Click here to search the product data sheet database](#)

Material Safety Data Sheet

24-Hour Emergency Telephone Numbers

HEALTH : ChevronTexaco Emergency Information Center (800) 231-0623 or (510) 231-0623

TRANSPORTATION : CHEMTREC (800) 424-9300 or (703) 527-3887

Emergency Information Centers are located in the U.S.A. International collect calls accepted.

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

Havoline® Motor Oil

Product Number(s): CPS222190, CPS222191, CPS222193, CPS222194, CPS222195, CPS222196, CPS222197

Synonyms: Havoline® Motor Oil SAE 5W-20, Havoline® Motor Oil SAE 5W-30, Havoline® Motor Oil SAE 10W-30, Havoline® Motor Oil SAE 10W-40, Havoline® Motor Oil SAE 20W-50, Havoline® Motor Oil SAE 30, Havoline® Motor Oil SAE 40

Company Identification

ChevronTexaco Global Lubricants
6001 Bollinger Canyon Road
San Ramon, CA 94583
United States of America

Product Information

Product Information: 800-LUBE-TEK
email : lubemsds@chevron.com

SECTION 2 COMPOSITION/ INFORMATION ON INGREDIENTS

COMPONENTS	CAS NUMBER	AMOUNT
Highly refined mineral oil (C15 - C50)	Mixture	75 - 94.99 %weight

Additives including	Mixture	10 - 24.99 %weight
Zinc dialkyldithiophosphate	68649-42-3	1 - 2.99 %weight

SECTION 3 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

IMMEDIATE HEALTH EFFECTS

Eye: Not expected to cause prolonged or significant eye irritation.

Skin: Contact with the skin is not expected to cause prolonged or significant irritation. Not expected to be harmful to internal organs if absorbed through the skin.

Ingestion: Not expected to be harmful if swallowed.

Inhalation: Not expected to be harmful if inhaled. Contains a petroleum-based mineral oil. May cause respiratory irritation or other pulmonary effects following prolonged or repeated inhalation of oil mist at airborne levels above the recommended mineral oil mist exposure limit. Symptoms of respiratory irritation may include coughing and difficulty breathing.

SECTION 4 FIRST AID MEASURES

Eye: No specific first aid measures are required. As a precaution, remove contact lenses, if worn, and flush eyes with water.

Skin: No specific first aid measures are required. As a precaution, remove clothing and shoes if contaminated. To remove the material from skin, use soap and water. Discard contaminated clothing and shoes or thoroughly clean before reuse.

Ingestion: No specific first aid measures are required. Do not induce vomiting. As a precaution, get medical advice.

Inhalation: No specific first aid measures are required. If exposed to excessive levels of material in the air, move the exposed person to fresh air. Get medical attention if coughing or respiratory discomfort occurs.

SECTION 5 FIRE FIGHTING MEASURES**FIRE CLASSIFICATION:**

OSHA Classification (29 CFR 1910.1200): Not classified by OSHA as flammable or combustible.

NFPA RATINGS: Health: 0 Flammability: 1 Reactivity: 0

FLAMMABLE PROPERTIES:

Flashpoint: (Cleveland Open Cup) 392 °F (200 °C) (Min) -

Autoignition: NDA

Flammability (Explosive) Limits (% by volume in air): Lower: NA Upper: NA

EXTINGUISHING MEDIA: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

PROTECTION OF FIRE FIGHTERS:

Fire Fighting Instructions: This material will burn although it is not easily ignited. For fires involving this material, do not enter any enclosed or confined fire space without proper protective equipment, including self-contained breathing apparatus.

Combustion Products: Highly dependent on combustion conditions. A complex mixture of airborne solids, liquids, and gases including carbon monoxide, carbon dioxide, and unidentified organic compounds will be

evolved when this material undergoes combustion. Combustion may form oxides of: Calcium, Sulfur, Zinc, Boron, Molybdenum, Nitrogen.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Protective Measures: Eliminate all sources of ignition in vicinity of spilled material.

Spill Management: Stop the source of the release if you can do it without risk. Contain release to prevent further contamination of soil, surface water or groundwater. Clean up spill as soon as possible, observing precautions in Exposure Controls/Personal Protection. Use appropriate techniques such as applying non-combustible absorbent materials or pumping. Where feasible and appropriate, remove contaminated soil. Place contaminated materials in disposable containers and dispose of in a manner consistent with applicable regulations.

Reporting: Report spills to local authorities and/or the U.S. Coast Guard's National Response Center at (800) 424-8802 as appropriate or required.

SECTION 7 HANDLING AND STORAGE

Precautionary Measures: Keep out of the reach of children.

General Handling Information: Avoid contaminating soil or releasing this material into sewage and drainage systems and bodies of water.

Static Hazard: Electrostatic charge may accumulate and create a hazardous condition when handling this material. To minimize this hazard, bonding and grounding may be necessary but may not, by themselves, be sufficient. Review all operations which have the potential of generating an accumulation of electrostatic charge and/or a flammable atmosphere (including tank and container filling, splash filling, tank cleaning, sampling, gauging, switch loading, filtering, mixing, agitation, and vacuum truck operations) and use appropriate mitigating procedures. For more information, refer to OSHA Standard 29 CFR 1910.106, 'Flammable and Combustible Liquids', National Fire Protection Association (NFPA 77, 'Recommended Practice on Static Electricity', and/or the American Petroleum Institute (API) Recommended Practice 2003, 'Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents'.

Container Warnings: Container is not designed to contain pressure. Do not use pressure to empty container or it may rupture with explosive force. Empty containers retain product residue (solid, liquid, and/or vapor) and can be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition. They may explode and cause injury or death. Empty containers should be completely drained, properly closed, and promptly returned to a drum reconditioner or disposed of properly.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

GENERAL CONSIDERATIONS:

Consider the potential hazards of this material (see Section 3), applicable exposure limits, job activities, and other substances in the work place when designing engineering controls and selecting personal protective equipment. If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, the personal protective equipment listed below is recommended. The user should read and understand all instructions and limitations supplied with the equipment since protection is usually provided for a limited time or under certain circumstances.

Special note: Do not use in breathing air apparatus or medical equipment.

ENGINEERING CONTROLS:

Use in a well-ventilated area.

PERSONAL PROTECTIVE EQUIPMENT

Eye/Face Protection: No special eye protection is normally required. Where splashing is possible, wear safety glasses with side shields as a good safety practice.

Skin Protection: No special protective clothing is normally required. Where splashing is possible, select

protective clothing depending on operations conducted, physical requirements and other substances. Suggested materials for protective gloves include: 4H (PE/EVAL), Nitrile Rubber, Silver Shield, Viton.

Respiratory Protection: No respiratory protection is normally required.

If user operations generate an oil mist, determine if airborne concentrations are below the occupational exposure limit for mineral oil mist. If not, wear an approved respirator that provides adequate protection from the measured concentrations of this material. For air-purifying respirators use a particulate cartridge.

Use a positive pressure air-supplying respirator in circumstances where air-purifying respirators may not provide adequate protection.

Occupational Exposure Limits:

Component	Limit	TWA	STEL	Ceiling	Notation
Highly refined mineral oil (C15 - C50)	ACGIH_TLV	5 mg/m3	10 mg/m3		
Highly refined mineral oil (C15 - C50)	OSHA_PEL	5 mg/m3			

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Attention: the data below are typical values and do not constitute a specification.

Color: Amber

Physical State: liquid

Odor: NDA

pH: NA

Vapor Pressure: <0.01 mmHg @ 100 °C

Vapor Density (Air = 1): >1

Boiling Point: >600 °F (>315 °C)

Solubility: Soluble in hydrocarbons; insoluble in water

Freezing Point: NA

Melting Point: NA

Specific Gravity: 0.86 - 0.88 @ 15.6 °C / 15.6 °C

Viscosity: 8.3 cSt - 18.6 cSt @ 100 °C (Min)

SECTION 10 STABILITY AND REACTIVITY

Chemical Stability: This material is considered stable under normal ambient and anticipated storage and handling conditions of temperature and pressure.

Incompatibility With Other Materials: May react with strong oxidizing agents, such as chlorates, nitrates, peroxides, etc.

Hazardous Decomposition Products: Hydrogen Sulfide (Elevated temperatures)

Hazardous Polymerization: Hazardous polymerization will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

IMMEDIATE HEALTH EFFECTS

Eye Irritation: The eye irritation hazard is based on evaluation of data for similar materials or product components.

Skin Irritation: The skin irritation hazard is based on evaluation of data for similar materials or product components.

components.

Skin Sensitization: No product toxicology data available.

Acute Dermal Toxicity: The acute dermal toxicity hazard is based on evaluation of data for similar materials or product components.

Acute Oral Toxicity: The acute oral toxicity hazard is based on evaluation of data for similar materials or product components.

Acute Inhalation Toxicity: The acute inhalation toxicity hazard is based on evaluation of data for similar materials or product components.

ADDITIONAL TOXICOLOGY INFORMATION:

This product contains petroleum base oils which may be refined by various processes including severe solvent extraction, severe hydrocracking, or severe hydrotreating. None of the oils requires a cancer warning under the OSHA Hazard Communication Standard (29 CFR 1910.1200). These oils have not been listed in the National Toxicology Program (NTP) Annual Report nor have they been classified by the International Agency for Research on Cancer (IARC) as; carcinogenic to humans (Group 1), probably carcinogenic to humans (Group 2A), or possibly carcinogenic to humans (Group 2B).

During use in engines, contamination of oil with low levels of cancer-causing combustion products occurs. Used motor oils have been shown to cause skin cancer in mice following repeated application and continuous exposure. Brief or intermittent skin contact with used motor oil is not expected to have serious effects in humans if the oil is thoroughly removed by washing with soap and water.

SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY

The toxicity of this material to aquatic organisms has not been evaluated. Consequently, this material should be kept out of sewage and drainage systems and all bodies of water.

ENVIRONMENTAL FATE

This material is not expected to be readily biodegradable.

SECTION 13 DISPOSAL CONSIDERATIONS

Oil collection services are available for used oil recycling or disposal. Place contaminated materials in containers and dispose of in a manner consistent with applicable regulations. Contact your sales representative or local environmental or health authorities for approved disposal or recycling methods. (See B.C. Reg. GY/92 Waste Management Act; R.R.O. 1990, Reg. 347 General-Waste Management; C.C.S.M.c. W40 The Waste Reduction and Prevention Act; N.S. Reg. 51/95 and N.S. Reg. 179/96 for examples of Provincial legislation.)

SECTION 14 TRANSPORT INFORMATION

The description shown may not apply to all shipping situations. Consult 49CFR, or appropriate Dangerous Goods Regulations, for additional description requirements (e.g., technical name) and mode-specific or quantity-specific shipping requirements.

DOT Shipping Name: NOT REGULATED AS A HAZARDOUS MATERIAL FOR TRANSPORTATION UNDER 49 CFR

DOT Hazard Class: NOT APPLICABLE

DOT Identification Number: NOT APPLICABLE

DOT Packing Group: NOT APPLICABLE

Additional Information: NOT HAZARDOUS BY U.S. DOT. ADR/RID HAZARD CLASS NOT APPLICABLE.

SECTION 15 REGULATORY INFORMATION

SARA 311/312 CATEGORIES:

1. Immediate (Acute) Health Effects:	NO
2. Delayed (Chronic) Health Effects:	NO
3. Fire Hazard:	NO
4. Sudden Release of Pressure Hazard:	NO
5. Reactivity Hazard:	NO

REGULATORY LISTS SEARCHED:

4_1=IARC Group 1	15=SARA Section 313
4_12A=IARC Group 2A	16=CA Proposition 65
4_12B=IARC Group 2B	17=MA RTK
05=NTP Carcinogen	18=NJ RTK
06=OSHA Carcinogen	19=DOT Marine Pollutant
09=TSCA 12(b)	20=PA RTK

The following components of this material are found on the regulatory lists indicated.

Zinc dialkyldithiophosphate 15

CERCLA REPORTABLE QUANTITIES(RQ)/SARA 302 THRESHOLD PLANNING QUANTITIES(TPQ):

Component	Component RQ	Component TPQ	Product RQ
Zinc dialkyldithiophosphate	1 lbs	None	98 lbs

CHEMICAL INVENTORIES:

CANADA: All the components of this material are on the Canadian DSL or have been notified under the New Substance Notification Regulations, but have not yet been published in the Canada Gazette.

EUROPEAN UNION: All the components of this material are in compliance with the EU Seventh Amendment Directive 92/32/EEC.

UNITED STATES: All of the components of this material are on the Toxic Substances Control Act (TSCA) Chemical Inventory.

NEW JERSEY RTK CLASSIFICATION:

Under the New Jersey Right-to-Know Act L. 1983 Chapter 315 N.J.S.A. 34:5A-1 et. seq., the product is to be identified as follows:

PETROLEUM OIL (Motor oil)

WHMIS CLASSIFICATION:

This product is not considered a controlled product according to the criteria of the Canadian Controlled Products Regulations.

SECTION 16 OTHER INFORMATION

NFPA RATINGS: Health: 0 Flammability: 1 Reactivity: 0

HMIS RATINGS: Health: 1 Flammability: 1 Reactivity: 0

(0-Least, 1-Slight, 2-Moderate, 3-High, 4-Extreme, PPE:- Personal Protection Equipment Index recommendation, *- Chronic Effect Indicator). These values are obtained using the guidelines or published evaluations prepared by the National Fire Protection Association (NFPA) or the National Paint and Coating Association (for HMIS ratings).

REVISION STATEMENT: This revision corrects the Product name. Other changes have been made throughout this Material Safety Data Sheet. Please read the entire document.

ABBREVIATIONS THAT MAY HAVE BEEN USED IN THIS DOCUMENT:

TLV	-	Threshold Limit Value	TWA	-	Time Weighted Average
STEL	-	Short-term Exposure Limit	PEL	-	Permissible Exposure Limit
			CAS	-	Chemical Abstract Service Number
NDA	-	No Data Available	NA	-	Not Applicable
<=	-	Less Than or Equal To	>=	-	Greater Than or Equal To

Prepared according to the OSHA Hazard Communication Standard (29 CFR 1910.1200) and the ANSI MSDS Standard (Z400.1).

The above information is based on the data of which we are aware and is believed to be correct as of the date hereof. Since this information may be applied under conditions beyond our control and with which we may be unfamiliar and since data made available subsequent to the date hereof may suggest modifications of the information, we do not assume any responsibility for the results of its use. This information is furnished upon condition that the person receiving it shall make his own determination of the suitability of the material for his particular purpose.

MATERIAL SAFETY DATA SHEET

IDENTITY (As used on label and list): **MAG 1 AW R&O INDUSTRIAL HYDRAULIC OIL ISO 32**

PRODUCT CODE: **MG423222, MG423255, MG42324P**

NFPA Hazard Identification 0 – Least 1 – Slight 2 – Moderate 3 – High 4 – Extreme

Health: 0

Fire: 1

Reactivity: 0

Section I - General Information

Warren Distribution, Inc.
2849 River Road
Council Bluffs, IA 51501
Information (402) 341-9397

Emergency **(402) 677-1331**

Chemtrec

(800) 424-9300

Reviewed: **04/04/03**

Section II - Composition/Information on Ingredients

COMPONENT NAME	%	CAS	OSHA PEL	ACGIH TLV
Lubricating Oil Base Stock	94-100	MIXTURE	5mg/m3*	5mg/m3*

*Numbers are for oil mist.

NON-HAZARDOUS INGREDIENTS

No IARC, NTP, OSHA and ACGIH listed carcinogens.

Section III - Hazards Identification

EYE CONTACT: Contact with eyes may cause eye irritation.

SKIN CONTACT: Prolonged or repeated contact may result in skin irritation or dermatitis.

INHALATION: Breathing oil mist in concentrations that exceed the TLV and PEL may result in respiratory discomfort and irritation.

INGESTION: Although this product is not expected to be acutely toxic, aspiration of liquid into the lungs during ingestion or vomiting may cause chemical pneumonitis.

CARCINOGENICITY: This product has not been classified as a carcinogen or probable carcinogen by OSHA, NTP, or IARC.

SIGNS AND SYMPTOMS OF OVEREXPOSURE: May cause skin, eye, or respiratory irritation

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: None recognized

OTHER HEALTH INFORMATION: None

Section IV - First Aid Procedures

EYE CONTACT: If splashed into eyes, flush with water for 15 minutes or until irritation subsides. Get medical attention if irritation persists.

SKIN CONTACT: Remove contaminated clothing. Wash skin thoroughly with soap and water. Get medical attention if irritation persists.

INHALATION: If overcome by vapor from hot product, immediately remove victim to fresh air. If breathing has stopped, administer artificial respiration. Call for medical attention. If overexposed to oil mist, remove from further exposure.

INGESTION: DO NOT induce vomiting, call medical attention immediately.

Section V - Fire and Explosion Hazard Data

Flash Point (deg F): > 360 Method Used: COC

Flammable or Explosive Limits (approximate % by volume in air) LEL: n/a UEL: n/a

EXTINGUISHING MEDIA: Use water spray, dry chemical, foam, or carbon dioxide. Use water to keep fire-exposed containers cool. Water spray may be used to flush spills away from exposures.

SPECIAL FIRE FIGHTING PROCEDURES: Self-contained breathing apparatus may be required.

UNUSUAL FIRE AND EXPLOSION HAZARDS: None known

Section VI - Accidental Release Measures

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Add sand, earth, or other suitable absorbent to spill area. Keep product out of sewers and waterways by damming or impounding.

Section VII - Handling and Storage

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Store in a cool, dry place with adequate ventilation. Do not expose to extreme temperatures or flames.

OTHER PRECAUTIONS: None

Section VIII - Exposure Controls/Personal Protection

RESPIRATORY PROTECTION: Use supplied-air respiratory protection in confined or enclosed space, if needed.

VENTILATION: Use local exhaust to capture vapor, mists or fumes, if necessary. Provide ventilation sufficient to prevent exceeding recommended exposure limit or buildup of explosive concentrations of vapor in air. Use explosion-proof equipment.

PROTECTIVE GLOVES: Use neoprene gloves, if needed, to avoid prolonged or repeated skin contact.

EYE PROTECTION: Wear goggles if there is likelihood of contact with eye(s).

OTHER PROTECTIVE EQUIPMENT: Use neoprene apron or other clothing, if needed, to avoid prolonged or repeated skin contact.

WORK PRACTICES/ENGINEERING CONTROLS: Keep containers closed when not in use.

PERSONAL HYGIENE: Wash skin thoroughly after contact, before breaks and meals, and at the end of the work period. Thoroughly clean contaminated clothing, including shoes, before re-use.

Section IX- Physical/Chemical Characteristics

Boiling Point (deg F): n/a Specific Gravity (H₂O=1): .92 Vapor Pressure (mm Hg): n/a
Melting Point (deg F): -35 Vapor Density (Air=1): n/a Solubility in Water: Insoluble
Evaporation Rate (n-butyl Acetate=1): n/a

APPEARANCE AND ODOR: Light amber liquid, mild petroleum odor.

Section X- Reactivity Data

STABILITY: Stable

CONDITIONS TO AVOID: None

INCOMPATIBILITY (MATERIALS TO AVOID): Strong oxidants such as liquid chlorine, concentrated oxygen, sodium hypochlorite or calcium hypochlorite

HAZARDOUS DECOMPOSITION OR BYPRODUCTS: Carbon monoxide, aldehydes, and other petroleum decomposition products. Oxides of sulfur, phosphorus, calcium, zinc, and hydrogen sulfide may also be present.

HAZARDOUS POLYMERIZATION: Will not occur

Section XI - Toxicological Information

See Section IV

Section XII - Ecological Information

Section XIII - Disposal Considerations

WASTE DISPOSAL METHOD: Place in an appropriate disposal facility in compliance with local regulations.

Section XIV - Transport Information

NOT A REGULATED ITEM ACCORDING TO DOT.

Section XV-Regulatory Information

SARA SECTION 313: This product contains less than 5.5% polycyclic aromatic compounds.

WHMIS classification for product: This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

This material safety data sheet and the information it contains is offered to you in good faith as accurate. We have reviewed any information contained in the data sheet which we received from sources outside our company and we believe that information to be correct, but cannot guarantee its accuracy or completeness. Health and safety precautions in this data sheet may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. No statement made in this data sheet shall be construed as permission or recommendation for the use of any product in a manner that might infringe existing patents. No warranty is made, either expressed or implied.

Air Monitoring Documentation Form

Appendix I



Columbia

AIR MONITORING LOG

Client Name _____ Date _____

Project No. _____ Page _____ of _____

Logged by _____

Weather _____

Instrument Types _____

Calibration Standards Used

[illegible]

Near Loss/Loss Incident Investigation Form

Appendix K



Incident Investigation

Loss ☐

Near Loss ☐

Injury ☐

Lead Investigator: _____

Date: _____

Project Number: _____

Site Information: _____

Incident Date: _____

Incident Time: _____

Personnel Involved: _____

Brief Description of Incident, Injuries, Property Damage:

Contributing Factors (How the Loss or Incident occurred):

Procedures (missing, incomplete, incorrect) :

Behavioral (lack of attention, directions or procedures not followed, missing or misunderstood communications, inadequate maintenance or housekeeping, inadequate training) :

Personal Protective Equipment (inadequate, improper, defective) :

Action Items: (for each item identified above, describe action items which will address the problem)

Action Item	Assigned To	Date Due	Date Completed

Signatures:

Employee: _____

Supervisor: _____

Investigator: _____

Date: _____

Date: _____

Date: _____

ATTACHMENT C
COLUMBIA ENVIRONMENTAL SERVICES, INC.
QUALIFICATIONS

Columbia Environmental Services, Inc.

Columbia Environmental Services provides environmental and construction services to the oil & gas, chemical, industrial, waste, wastewater, geological & engineering consulting, and real estate industries. Founded in 2002, Columbia has evolved into one of the most diverse small business entities in Texas, offering a wide-range of environmental construction services in remediation system installation, excavation and disposal, soil/sludge solidification, landfills, ground water, above ground/underground storage tanks, wetlands, waste management, decontamination, demolition and transportation.

Columbia is committed to both employees and clients in providing safe and environmentally sound work practices. Utilizing a top-down approach, accountability to keeping our work environment safe is encouraged and demonstrated throughout the organization. Our behavioral-based program is part of our everyday approach to providing safe, cost-effective remedial solutions to every project. We continue to build our reputation by maintaining high expectations/standards on every project, every day.

Tank Cleaning / Confined Space Entry Services

Columbia provides the petroleum industry with economical means of resource recovery and assists facilities in resolving potential environmental problems. We provide processing of petroleum production sludges and emulsions, refinery sludges and emulsions, biosludges, and alkylation sludges. Our effluent streams produce the highest volume of merchantable oil and the oil and water removal from solids reduces the cost of secondary treatment process whether it is thermal, cement kiln, or coker slurry injection.

Waste Transportation and Disposal Services

Columbia provides hazardous and non-hazardous waste management services to a variety of industrial, institutional and governmental customers. Our association with the largest waste disposal companies in the United States, and our affiliations with other approved disposal/recycling supplies, gives Columbia the ability to handle, transport, dispose or recycle virtually any type of waste material.

Columbia has considerable capabilities and experience in the following areas:

- Non-Hazardous Landfill Disposal
- Hazardous Landfill Disposal
- RCRA Stabilization
- Bioremediation
- Fuel Blending Incineration Treatment
- Recycling

Columbia provides assistance in preparing manifests and shipping documents when requested, helping to assure complete regulatory compliance across state borders. Whether shipping large amounts of waste materials or less-than-truckload quantities of waste, customers rely on Columbia to provide all needed transportation and documentation services. Services arranged by or available from Columbia include: Roll-off Trailers, Roll-off Trucks, Local Freight Vans, Regulatory Guideline Compliance, End-dump Trailers, and Tractor-Trailer Combination.

ATTACHMENT D

**COLUMBIA ENVIRONMENTAL SERVICES, INC.
INSURANCE CERTIFICATE**



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

7/13/2009

PRODUCER Phone: 713-880-7100 Fax: 713-880-7166
Bowen, Miclette & Britt Insurance Agency, LLC
1111 North Loop West, #400
Houston TX 77008

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

INSURED
Columbia Environmental Services, Inc.
13222 Reeveston Road
Houston TX 77039

INSURERS AFFORDING COVERAGE**NAIC #**INSURER A: Ironshore Specialty Insurance

25445

INSURER B: Redland Insurance Co

INSURER C:

INSURER D:

INSURER E:

COVERAGES

THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. AGGREGATE LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR	ADD'L	TYPE OF INSURANCE	POLICY NUMBER	POLICY EFFECTIVE DATE (MM/DD/YYYY)	POLICY EXPIRATION DATE (MM/DD/YYYY)	LIMITS
A		GENERAL LIABILITY <input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS MADE <input checked="" type="checkbox"/> OCCUR <input checked="" type="checkbox"/> Prof. Liab <input checked="" type="checkbox"/> CPL GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC	01F2M0918002	7/12/2009	7/12/2010	EACH OCCURRENCE \$1,000,000 DAMAGE TO RENTED PREMISES (Ea occurrence) \$500,000 MED EXP (Any one person) \$25,000 PERSONAL & ADV INJURY \$1,000,000 GENERAL AGGREGATE \$2,000,000 PRODUCTS - COMP/OP AGG \$2,000,000
B		AUTOMOBILE LIABILITY <input checked="" type="checkbox"/> ANY AUTO <input type="checkbox"/> ALL OWNED AUTOS <input type="checkbox"/> SCHEDULED AUTOS <input type="checkbox"/> HIRED AUTOS <input type="checkbox"/> NON-OWNED AUTOS	RICIS0001032	7/12/2009	7/12/2010	COMBINED SINGLE LIMIT (Ea accident) \$1,000,000 BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$
		GARAGE LIABILITY <input type="checkbox"/> ANY AUTO				AUTO ONLY - EA ACCIDENT \$ OTHER THAN EA ACC \$ AUTO ONLY: AGG \$
A		EXCESS / UMBRELLA LIABILITY <input checked="" type="checkbox"/> OCCUR <input type="checkbox"/> CLAIMS MADE <input type="checkbox"/> DEDUCTIBLE RETENTION \$	01F2M0918002	7/12/2009	7/12/2010	EACH OCCURRENCE \$4,000,000 AGGREGATE \$4,000,000 \$ \$ \$
		WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? <input type="checkbox"/> (Mandatory in NH) If yes, describe under SPECIAL PROVISIONS below OTHER				WC STATUTORY LIMITS <input type="checkbox"/> OTH-ER <input type="checkbox"/> E.L. EACH ACCIDENT \$ E.L. DISEASE - EA EMPLOYEE \$ E.L. DISEASE - POLICY LIMIT \$

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES / EXCLUSIONS ADDED BY ENDORSEMENT / SPECIAL PROVISIONS

Cancellation Provision shown herein is subject to shorter or longer time periods depending on the jurisdiction of, and reason for, the cancellation.

When required by written contract, those Parties listed in said contract, including the certificate holder, are added as an Additional Insured excluding Workers' Compensation and Employers' Liability but limited to the operations of the Named Insured under said contract, and always subject to the policy terms, conditions and exclusions.
See Attached...

CERTIFICATE HOLDER

Pastor, Behling & Wheeler, LLC
2201 Double Creek Drive, Suite 4004
Round Rock TX 78664

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, THE ISSUING INSURER WILL ENDEAVOR TO MAIL 30 DAYS WRITTEN NOTICE TO THE CERTIFICATE HOLDER NAMED TO THE LEFT, BUT FAILURE TO DO SO SHALL IMPOSE NO OBLIGATION OR LIABILITY OF ANY KIND UPON THE INSURER, ITS AGENTS OR REPRESENTATIVES.

AUTHORIZED REPRESENTATIVE

IMPORTANT

If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

DISCLAIMER

The Certificate of Insurance on the reverse side of this form does not constitute a contract between the issuing insurer(s), authorized representative or producer, and the certificate holder, nor does it affirmatively or negatively amend, extend or alter the coverage afforded by the policies listed thereon.

Description of operations/locations/vehicles/exclusions added by endorsement/special provisions (continued):

The Auto Liability and General Liability policies are hereby endorsed as follows: The United States Environmental Protection Agency, Client, Owner and Consultant are additional insured as respects General Liability and Auto Liability when required by insured's written contract with Client. Umbrella follows form of underlying. The United States Environmental Protection Agency, the Client and its employees, officers, directors, agents, partners, successors, and assigns and Consultant and its employees, officers, directors, agents, partners, successors and assigns are named as additional insureds as respects General Liability & Automobile Liability regardless of whether such additional insured is jointly or concurrently negligent when required by written insured contract.

Waiver of subrogation in favor of The United States Environmental Protection Agency, Client, Owner and Consultant as respects General Liability and Auto Liability when required by written insured contract. The policies of Columbia and its agents, affiliates or subcontractors shall be primary insurance (General Liability & Auto Liability) and not contributory (General Liability Only) with any other insurance that Client may have in effect. General Liability, Auto Liability and Workers' Compensation have been endorsed to provide, as evidenced by this Certificate of insurance, that in the event that the insurance is canceled, reduced, restricted or changed in any way, the company will provide at least thirty (30) days prior written notice to the Consultant.

Consultant: Pastor, Behling & Wheeler, LLC

Client: Chromalloy American Corporation and The Dow Chemical Company